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Final Response to BDAT Related Comments Document General BDAT Issues. Volume 1-A-2

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This response to comments document only addresses those comments which were submitted on the proposed land disposal restrictions for those waste codes and general BDAT technologies and issues which relate to Third Third Wastes Treatment Standards.

The commenters presented in this document are grouped according to major concerns of the commenters.

The document contains PQL, wastewaters/Nonwastewaters, Grab/Composite samples, quantification complications for P and U wastes, and soil and debris.

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FINAL
RESPONSE TO BDAT RELATED COMMENTS DOCUMENT

General BDAT Issues

VOLUME I-A-2

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May 1990

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INTRODUCTION

This response to comments document only addresses those comments which were submitted on the proposed land disposal restrictions for those waste codes and general BDAT technologies and issues which relate to Third Third Wastes Treatment Standards.

The commenters presented in this document are grouped according to major concerns of the commenters. This document is comprised of the following sections:

ISSUE CODE 1: General BDAT Aspects
ISSUE CODE 2: D001 - Characteristic Ignitable Wastes
ISSUE CODE 3: D002 - Characteristic Corrosive Wastes
ISSUE CODE 4: D003 - Characteristic Reactive Wastes and P and U Wastes Containing Reactive Listing Constituents
ISSUE CODE 5: D004/D010 - Characteristic Wastes for Arsenic and Selenium and K, P, and U Wastes Containing Arsenic and Selenium
ISSUE CODE 6: D005 - Characteristic Wastes for Barium and P013
ISSUE CODE 7: D006 - Characteristic Wastes for Cadmium
ISSUE CODE 8: D007 - Characteristic Wastes for Chromium
ISSUE CODE 9: D008 - Characteristic Wastes for Lead P and U Wastes Containing Lead
ISSUE CODE 10: D009 - Characteristic Wastes for Mercury P and U Wastes Containing Mercury
ISSUE CODE 11: K044, K045, K047: Wastes from the Manufacturing and Processing of Explosives
ISSUE CODE 12: D011 - Characteristic Wastes for Silver
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ISSUE CODE 25: K015 - Still Bottoms from Benzal Chloride

ISSUE CODE 26: K021 - Spent Antimony Catalyst.

(No Comments Were Received for this Waste Code)

ISSUE CODE 27: K046 - WW Treatment Sludges from Manufacturing, Formulating, and Loading of Lead-Based Initiating Compounds

ISSUE CODE 28: K060 - Ammonia Still Lime Sludge.

(No Comments Were Received for this Waste Code)

ISSUE CODE 29: K061 - Electric Arc Furnace Dust

ISSUE CODE 30: K069 - Emission Control Dust/Sludge from Secondary Lead Smelting

ISSUE CODE 31: K071, K106 - Mercury Cell Process Wastes

ISSUE CODE.32: K073 - Chlorinated Hydrocarbon Wastes.

(No Comments Were Received for this Waste Code)

ISSUE CODE 33: K086 - Residues from Ink Formulation

ISSUE CODE 34: K100 - Waste Leaching Solution from Acid Leaching of Emission Control Dust/Sludge from Secondary Lead Smelting

(No Comments Were Received for this Waste Code)

ISSUE CODE 35: Wastes Containing Cyanide

ISSUE CODE 36: K017 - Wastes from the production of Epichlorohydrin

(No Comments Were Received for this Waste Code)

ISSUE CODE 37: K028,K029, K095, K096 - Production of 1,1,1-Trichloroethane

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(No Comments Were Received for this Waste Code)

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(No Comments Were Received for this Waste Code)

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(No Comments Were Received for this Waste Code)

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Commenters are identified by both commenter number and commenter name. Comments within each section of this document have been assigned a sequential comment number.

Issues were obtained from the original comment submittal and were categorized based on the grouping specified above. The Agency's response to each comment follows immediately after the text of the document. For responses related to capacity issues, the reader should review the "Response to Comments Background Document for the Third Third Land Disposal Restrictions Proposed Rule, November 22, 1989. Volume II Capacity Related Comments." For information regarding broad policy questions, the reader is directed to the "Response to Comments Background Document for the Third Third Land Disposal Restrictions Proposed Rule, November 22, 1989. Volume III Policy Related Comments."

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No Comments Were Received for this Waste Code

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Comment Number: 1-D-8
Docket Number: LD12-00179
Commenter: Dow Chemical
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

IV. RELATIONSHIP OF TREATMENT STANDARDS TO PRACTICAL QUANTIFICATION LIMITS (PQLs).

54 Fed. Reg. 48,385 column 2

EPA has recognized that some of the treatment standards require measurement of analytes below published PQLs. Although the Agency contends that treatment residues may have matrices conducive to quantitation at levels below PQLs, they recognize that because of matrix effects, one cannot always quantitatively measure analytes at the level required by the treatment standard. Dow has found this to be true and, in fact, has already applied for variances from treatment standards as prescribed by previous Land Disposal Restriction regulations and as proposed here.

The variance procedure is not the way to handle this problem. While Dow has already recognized the need for variances for routine waste streams, this is only the tip of the iceberg. More than 90 percent of the waste codes that Dow handles are nonroutine wastes created by equipment clean-outs, off-spec batches, spills, etc. While these nonroutine wastes/codes represent less than 5 percent of the total volume, they represent a large portion of our analytical load. Disposal decisions, regulated/nonregulated decisions and restricted/nonrestricted decisions must be made for each waste code prior to handling. Since the present variance system requires 100% compliance until the variance is granted, a facility must predict whether or not it will be able to meet the required detection limits. However, there is no way to anticipate matrix effects for these wastes or their treatment residues. Therefore a variance cannot be obtained which will ensure continued compliance.

Dow proposes that EPA adopt a procedure that whenever an analyte's concentration cannot be determined at the regulatory (or restricted) level, one is assumed to be in compliance if the concentration is below the quantification level. The laboratory would be required to use appropriate analytical methods including mandated quality control. The laboratory would then establish a quantitation limit for the analyte in the matrix in light of the specified quality control requirements. Dow would be happy to discuss with EPA the details of just how such matrix specific quantitation limits could be measured and documented. Such documentation would be retained by the generator/disposer to verify compliance.

COMMENT NUMBER: 1-D-8
DOCKET NUMBER: LD12-00179
COMMENTER: Dow Chemical
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

EPA has published its methodology to calculate treatment standards as the detection limit or concentration level (if detected) times the accuracy correction factor times the variability factor. This methodology was published as part of the First and Second Thirds Final Rules. The Agency did not receive any substantial comments concerning the methodology used to calculate the treatment standards.

EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste.

The PQLs in SW-846 were not developed for a specific waste matrix. PQLs are presented for groundwater and low-level soil. Correction

COMMENT NUMBER: 1-D-8 (continued)
DOCKET NUMBER: LD12-00179
COMMENTER: Dow Chemical
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

factors are given for other matrices such as high level soil and non-water miscible waste. Correction factors for treatment residuals such as incinerator ash are not given. Detection limits and PQLs are directly related to the constituent of interest and to the amount of interferences that are present in different waste matrices, therefore, detection limits and PQLs are generally significantly lower for treatment residuals than for untreated waste.

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit. Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix. If PQLs were presented for data submitted for this rule, as a factor of the detection limit, then the detection limit information was used to assess the data.

The standards promulgated in the Third Third final rule are derived from detection limits achieved from studies of specific "F" or "K" waste or from the incineration of chemicals listed for specific "U" or "P" wastes or of a similar waste when the treatment standards are transferred. Since the detection limits used to derive the standards are based on the detection limits achieved by the laboratory that analyzed the sample, the

COMMENT NUMBER: 1-D-8 (continued)
DOCKET NUMBER: LD12-00179
COMMENTER: Dow Chemical
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

Agency believes that other laboratories can achieve the same detection limits. In cases where more than one set of data were used to develop the treatment standard, the highest detection limit was usually selected as the basis for the treatment standard. Therefore, the resulting treatment standards reflect the best level of analytical performance that is achievable for the waste.

The Agency does not plan to change its methodology for calculating treatment standards. As a result, only information on detection limits and recovery values were evaluated and used to assess the proposed standards. The Agency did not use any information presented in the HWTC study concerning practical quantification limits to recalculate the standards to be promulgated for the U and P waste codes and for multi-source leachate nonwastewaters. In addition, EPA did not reevaluate standards that were promulgated for wastes under the solvents rule, the First Thirds Rule or the Second Thirds Rule.

Several commenters, however, raised the issue that, in certain cases, analytical problems (i.e., difficulties in reliable quantitation at detection limits near the concentration-based treatment standards) may prevent demonstrating compliance with the proposed treatment standards for Third Third wastes. They also pointed out that this same problem already may exist for some First and Second Third wastes.

COMMENT NUMBER: 1-D-8 (continued)
DOCKET NUMBER: LD12-00179
COMMENTER: Dow Chemical
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

EPA has examined the data submitted to the Agency in support of these comments. While the Agency does not believe that the currently available data is conclusive, EPA acknowledges that there can be situations where lack of available analytical methods may prevent demonstration of compliance with the treatment standards.

EPA is dealing with this potential problem in a number of ways. First, EPA has examined detection limit data submitted by the commenters and compared them to the data used to develop the proposed standards. After a thorough technical evaluation, the Agency incorporated a portion of these data into the promulgated standards in today's rule. In addition, the Agency has reevaluated the existing BDAT data generated by the Agency, the transfer procedures used for some of the wastes, and recently available information and data on recovery of the BDAT organic constituents. Thus, EPA concurred with the commenters and concluded that many of the other proposed concentration-based treatment standards may not be achievable. As a result, EPA is promulgating revised standards for some organics in nonwastewaters that are higher than the proposed standards. In doing so, the majority of the commenters' concerns over achievability are no longer applicable. (Note: The Agency is continuing to study this issue and, if warranted, may adjust other standards, including some for First and Second Third wastes, after sufficient public notice.)

COMMENT NUMBER: 1-D-8 (continued)
DOCKET NUMBER: LD12-00179
COMMENTER: Dow Chemical
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

Second, in certain situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT, the Agency has decided that reliance upon the treatability variance petition process would place an unnecessary burden on both the regulated and regulatory communities. The commenter proposed a similar procedure and EPA agrees this is appropriate. The Agency believes that where a waste has been treated with a combustion BDAT process (i.e., incineration or fuel substitution unit), and if the person has made a good faith effort to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

In order to demonstrate compliance in such cases, the person will have had to make a good faith effort to demonstrate that the analyte of concern is not present in the waste at, or above, the treatment standard. To provide a more concrete basis for making such demonstrations, EPA intends to develop and issue guidance on what constitutes a good faith effort to achieve such analytical sensitivity within the next few months. This guidance is anticipated to be available at or near the effective date for the treatment standards.

In developing the treatment standards in today's rule, the Agency selected the treatment data (i.e., detection limit data) that best represented what the majority of wastes could meet. (Note: Most of these data were from incinerator units that were considered well-designed

COMMENT NUMBER: 1-D-8 (continued)

DOCKET NUMBER: LD12-00179

COMMENTER: Dow Chemical

ISSUE: General BDAT Aspects

SUBISSUE: PQLs

RESPONSE:

and well-operated.) However, the Agency rejected detection limit data for some wastes, because the Agency determined that these wastes were not necessarily representative of the treatability of other wastes. After reexamination of all of the available detection limit data, the Agency has found that the majority of the detection limit data for these wastes will generally not exceed the promulgated treatment standards by more than one order of magnitude.

Thus, until this formal guidance is available, the Agency will therefore consider that, if an analytical sensitivity (i.e., detection limit) within an order of magnitude of the treatment standards has been achieved, compliance with the treatment standard will be considered to have been demonstrated provided the data represents the use of a combustion process (i.e., restricted to incineration or fuel substitution in a unit in compliance with all applicable technical operating requirements under 40 CFR 264 Subpart O and 265 Subpart O. Thus, it is likely that the combustion unit is being operated properly). The Agency believes that this is consistent with RCRA section 3304(m), in that, as an alternative to specifying a concentration-based standard for these wastes, the Agency could have promulgated a method of treatment specifying the use of incineration or fuel substitution.

EPA is thus amending section 268.7 and 268.43 to state that where a treatment standard for organics in nonwastewaters is based on a combustion technology, and a waste has been treated using that treatment

COMMENT NUMBER: 1-D-8 (continued)

DOCKET NUMBER: LD12-00179

COMMENTER: Dow Chemical

ISSUE: General BDAT Aspects

SUBISSUE: PQLs

RESPONSE:

method (i.e., restricted to incineration or fuel substitution in units operated in accordance with the technical operating requirements of 40 CFR 264 Subpart O and 265 Subpart O), if a good faith effort has been made to analytically demonstrate compliance with the treatment standard, the treatment facility may certify compliance with the standard based on the data obtained. This includes all waste codes in First, Second, and Third Thirds where standards for organics in nonwastewaters are based on combustion processes or were transferred from wastes based on combustion processes.

The Agency also points out that in cases where a facility believes that waste-specific treatment standards cannot be met because their laboratory is still unable to achieve detection limits below the treatment standards on specific treatment residuals, and: 1) the facility complies with all the other conditions mentioned above; or 2) a facility utilizes a combustion technology other than incineration or fuel substitution; or 3) a facility utilizes a noncombustion technology that can be demonstrated to be equivalent, the facility may submit a petition for a variance from the treatment standards for that particular waste code (EPA construes 40 CFR 268.44 as encompassing such petitions). The facility must demonstrate that the analyses are in compliance with all other BDAT QA/QC provisions (as outlined in the BDAT General Quality Assurance Project Plan (EPA/530-SW-87-011, March 1987). Moreover, the petitioner must also demonstrate that the treatment process is a well-designed and well-operated BDAT process.

Comment Number: 1-D-9
Docket Number: LD12-00223
Commenter: Chemical Processors, Inc.
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

This comment is in regards to the level of treatment standards versus PQL's specified in SW-846. When treatment standards are below PQL's and when the analytical system is optimized for the ranges specified in SW-846, is EPA requiring then that analytical systems be optimized to levels below what SW-846 requires? Many labs throughout the country are not using state-of-the-art equipment and, while it is possible to reach PQL's, some labs can not detect below these levels. PQL's are not always matrix dependent, as in 8080, which specifies the method detection limit as the PQL for water samples. The detection limits for metals analysis by Flame AA in SW-846 should be the lowest limit set as treatment standards, except for those metals which have to be analyzed by other methods (i.e. graphite furnace AA, gaseous hydride AA, or cold vapor AA). This will insure analytical needs will be met without increasing costs. Treatment standards promulgated below SW-846 PQL's should be accompanied by method modifications required to meet these new detection limits.

In following SW-846 methods, does the EPA data from incinerator ash analysis meet QA/QC requirements for surrogate and spike recoveries? If these requirements are not met, due to the absorbant quality of incinerator ash, what rationale was used in drawing conclusions from the data generated?

COMMENT NUMBER: 1-D-9

DOCKET NUMBER: LD12-00223

COMMENTER: Chemical Processors, Inc.

ISSUE: General BDAT Aspects

SUBISSUE: PQLs

RESPONSE:

EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste. PQLs are minimum measures of analytical laboratory performance, as defined in SW-846 for the use of laboratories in assessing their own performance in terms of success in reaching low levels of certain analytes in certain matrices. Outside of this function of providing a quantitative definition of the boundaries between poor and competent analytical performance, PQLs have no regulatory power. Therefore, analytical systems should be optimized to the method detection limit level.

The PQLs in SW-846 were not developed for a specific waste matrix. PQLs are presented for groundwater and low-level soil. Correction factors are given for other matrices such as high level soil and

COMMENT NUMBER: 1-D-9 (continued)
DOCKET NUMBER: LD12-00223
COMMENTER: Chemical Processors, Inc.
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

non-water miscible waste. Correction factors for treatment residuals such as incinerator ash are not given. Detection limits and PQLs are directly related to the constituent of interest and to the amount of interferences that are present in different waste matrices, therefore, detection limits and PQLs are generally significantly lower for treatment residuals than for untreated waste.

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit. Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix.

The standards promulgated in the Third Third final rule are derived from detection limits achieved from studies of specific "F" or "K" waste or from the incineration of chemicals listed for specific "U" or "P" wastes or of a similar waste when the treatment standards are transferred. Since the detection limits used to derive the standards are based on the detection limits achieved by the laboratory that analyzed the sample, the Agency believes that other laboratories can achieve the same detection limits. In cases where more than one set of data were used to develop the treatment standard, the highest detection limit was usually selected as the basis for the treatment standard. Therefore, the resulting treatment standards reflect the best level of analytical performance that

COMMENT NUMBER: 1-D-9 (continued)
DOCKET NUMBER: LD12-00223
COMMENTER: Chemical Processors, Inc.
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

is achievable for the waste. As a result, the Agency believes that all of the concentration-based standards can be analyzed at the levels promulgated for the treatment standards.

For metals, the Agency has promulgated standards based on the best level of treatment performance for the waste. The Agency has also selected the best analytical method in SW-846 with the lowest sensitivity to determine this level of performance. Therefore, the treater and/or generator must also select the analytical method that is appropriate for measuring the metal of concern at the level set for the treatment standard.

However, the Agency does recognize that there may be situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT. For these cases, the Agency has decided that reliance upon the treatability variance petition process would place an unnecessary burden on both the regulated and regulatory communities. The Agency believes that where a waste has been treated with a combustion BDAT process (i.e., incineration or fuel substitution unit), and if the person has made a good faith effort to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

COMMENT NUMBER: 1-D-9 (continued)
DOCKET NUMBER: LD12-00223
COMMENTER: Chemical Processors, Inc.
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

In order to demonstrate compliance in such cases, the person will have had to make a good faith effort to demonstrate that the analyte of concern is not present in the waste at, or above, the treatment standard. To provide a more concrete basis for making such demonstrations, EPA intends to develop and issue guidance on what constitutes a good faith effort to achieve such analytical sensitivity within the next few months. This guidance is anticipated to be available at or near the effective date for the treatment standards.

The EPA data were generated following SW-846 methods and following the established QA/QC plan as outlined in the BDAT Generic Quality Assurance Project Plan (EPA/530-SW-87-011) that was published as part of the First Third Final Rule. EPA did not receive any substantial comments concerning this plan during the comment period for the rule.

All data used to calculate concentration-based treatment standards were determined to be of adequate quality based on the requirements outlined in the BDAT Generic Quality Assurance Project Plan. Calculations were performed using the methodology published in the First and Second Third Rule.

Comment Number: 1-D-10
Docket Number: LD12-00240
Commenter: Amoco Corporation
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

Section III.A.1.e.(3)

The Agency responds to the regulated community's concerns about the ability to demonstrate compliance with treatment standards with current analytical methods, because analytical laboratories following SW-846 procedures have reported practical quantitation limits (PQLs) for certain treatment residues greater than the treatment standard. Only organics in incineration residues are discussed. This discussion does not adequately address organic constituents in residues from processes other than incineration, or inorganic constituents. In Amoco's additional data submission to EPA (sent to the docket December 20, 1989) and presentation to the Agency on that same date, we provided information on inorganic standards for K048-K052 listed wastes that were below PQLs for different laboratories following EPA procedures. Obviously, these standards are inappropriately close to analytical limitations.

COMMENT NUMBER: 1-D-10
DOCKET NUMBER: LD12-000240
COMMENTER: Amoco Corporation
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

EPA has published its methodology to calculate treatment standards as the detection limit or concentration level (if detected) times the accuracy correction factor times the variability factor. This methodology was published as part of the First and Second Thirds Final Rules. The Agency did not receive any substantial comments concerning the methodology used to calculate the treatment standards.

The commenter raised the issue that, in certain cases, analytical problems (i.e., difficulties in reliable quantitation at detection limits near the concentration-based treatment standards) may prevent demonstrating compliance with the proposed treatment standards for Third Third wastes. EPA has examined the data submitted to the Agency in support of these comments. EPA also reviewed all stabilization data submitted by industry to the Agency.

The majority of the stabilization data submitted by industry could not be considered in developing the promulgated inorganic standards for the following reasons: (1) data were not provided for a majority of the regulated constituents, (2) untreated waste data were not provided, and, therefore, no determination of substantial treatment could be made, (3) detection limits were not provided for undetected samples, and/or (4) treatment was not demonstrated for a majority of the regulated metal constituents.

COMMENT NUMBER: 1-D-10

DOCKET NUMBER: LD12-000240

COMMENTER: Amoco Corporation

ISSUE: General BDAT Aspects

SUBISSUE: PQLs

RESPONSE:

Based on the data that could be used to calculate treatment standards, the metal standards were revised for K048-K052 to reflect data that showed substantial treatment for the metals and was of adequate quality. Therefore, the Agency believes that the treatment standards can be achieved by laboratories using EPA approved methods.

Comment Number: 1-D-11

Docket Number: LD12-00242

Commenter: Merck & Co., Inc.

Issue: General BDAT Aspects

Subissue: PQLs

Comment:

Merck agrees with the approach of using concentration-based treatment standards rather than specific technologies because this allows flexibility in the choice of treatments. However, the proposal states that many of these treatment standards are set at or below practical quantitation limits or PQLs. In the SW-846 and the proposal, EPA has defined a PQL as "... the lowest level of quantitation that the Agency believes a competent laboratory can be expected to reliably achieve." Furthermore, EPA states that PQLs are directly related to the amount of interference present in the different waste matrices, and that the PQLs listed in SW-846 are not always achievable for constituents as measured in untreated wastes. EPA has expended much time and energy in the development of the SW-836 methods for solid wastes. The Agency has not provided any scientific support for any alternate methods in this proposal. For the Agency to set treatment standards below the PQLs, the Agency's own manual states cannot always be met, is scientifically unsupportable. The Agency's assertion that incineration may destroy the compounds that could interfere with the analyses and that lower detection levels will probably be achievable is at this point nothing more than unsupported wishful thinking.

COMMENT NUMBER: 1-D-11

DOCKET NUMBER: LD12-00242

COMMENTER: Merck & Co., Inc.

ISSUE: General BDAT Aspects

SUBISSUE: PQLs

RESPONSE:

EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste.

The PQLs in SW-846 were not developed for a specific waste matrix. PQLs are presented for groundwater and low-level soil. Correction factors are given for other matrices such as high level soil and non-water miscible waste. Correction factors for treatment residuals such as incinerator ash are not given. Detection limits and PQLs are directly related to the constituent of interest and to the amount of interferences that are present in different waste matrices, therefore, detection limits and PQLs are generally significantly lower for treatment residuals than for untreated waste.

COMMENT NUMBER: 1-D-11 (continued)
DOCKET NUMBER: LD12-00242
COMMENTER: Merck & Co., Inc.
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit. Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix. If PQLs were presented for data submitted for this rule, as a factor of the detection limit, then the detection limit information was used to assess the data.

The standards promulgated in the Third Third final rule are derived from detection limits achieved from studies of specific "F" or "K" waste or from the incineration of chemicals listed for specific "U" or "P" wastes or of a similar waste when the treatment standards are transferred. Since the detection limits used to derive the standards are based on the detection limits achieved by the laboratory that analyzed the sample, the Agency believes that other laboratories can achieve the same detection limits. In cases where more than one set of data were used to develop the treatment standard, the highest detection limit was usually selected as the basis for the treatment standard. Therefore, the resulting treatment standards reflect the best level of analytical performance that is achievable for the waste. The Agency does not plan to change its methodology for calculating treatment standards.

Comment Number: 1-D-12
Docket Number: LD12 - 00253
Commenter: NJ EPA
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

We would also like to comment on the "Analytical Requirements and Relationships of PQLs to BDAT". Section III. e., (3) (p. 48385) discusses the relationship of Treatment Standards to Practical Quantitation Limits (PQLs). For situations where laboratories are unable to achieve PQLs below the treatment standard on specific treatment residuals, the facility is allowed to submit a petition for a variance from the standard for that particular waste code. We believe that the facility should be required to demonstrate that the PQLs could not be met by at least two other laboratories, and that the documentation accompanies the petition. This would then rule out the possibility of substandard achievement by the facility's laboratory. Additionally, we believe that a national RCRA laboratory certification program would ensure performance consistency and would facilitate the inter-laboratory studies necessary for better PQL and matrix-specific correction factor development.

COMMENT NUMBER: 1-D-12
DOCKET NUMBER: LD12-00253
COMMENTER: NJ EPA
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

In situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT, the Agency has decided that reliance upon the treatability variance petition process would place an unnecessary burden on both the regulated and regulatory communities. The Agency believes that where a waste has been treated with a combustion BDAT process (i.e., incineration or fuel substitution unit), and if the person has made a good faith effort to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

In order to demonstrate compliance in such cases, the person will have had to make a good faith effort to demonstrate that the analyte of concern is not present in the waste at, or above, the treatment standard. To provide a more concrete basis for making such demonstrations, EPA intends to develop and issue guidance on what constitutes a good faith effort to achieve such analytical sensitivity within the next few months. This guidance is anticipated to be available at or near the effective date for the treatment standards.

In developing the treatment standards in the Third Third Rule, the Agency selected the treatment data (i.e., detection limit data) that best represented what the majority of wastes could meet. (Note: Most of

COMMENT NUMBER: 1-D-12
DOCKET NUMBER: LD12-00253
COMMENTER: NJ EPA
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

these data were from incinerator units that were considered well-designed and well-operated.) However, the Agency rejected detection limit data for some wastes, because the Agency determined that these wastes were not necessarily representative of the treatability of other wastes. After reexamination of all of the available detection limit data, the Agency has found that the majority of the detection limit data for these wastes will generally not exceed the promulgated treatment standards by more than one order of magnitude.

Thus, until this formal guidance is available, the Agency will therefore consider that, if an analytical sensitivity (i.e., detection limit) within an order of magnitude of the treatment standard has been achieved, compliance with the treatment standard will be considered to have been demonstrated provided the data represents the use of a combustion process (i.e., restricted to incineration or fuel substitution in a unit in compliance with all applicable technical operating requirements under 40 CFR 264 Subpart O and 265 Subpart O. Thus, it is likely that the combustion unit is being operated properly). The Agency believes that this is consistent with RCRA section 3304(m), in that, as an alternative to specifying a concentration-based standard for these wastes, the Agency could have promulgated a method of treatment specifying the use of incineration or fuel substitution.

EPA is thus amending section 268.7 and 268.43 to state that where a treatment standard for organics in nonwastewaters is based on a

COMMENT NUMBER: 1-D-12
DOCKET NUMBER: LD12-00253
COMMENTER: NJ EPA
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

combustion technology, and a waste has been treated using that treatment method (i.e., restricted to incineration or fuel substitution in units operated in accordance with the technical operating requirements of 40 CFR 264 Subpart O and 265 Subpart O), if a good faith effort has been made to analytically demonstrate compliance with the treatment standard, the treatment facility may certify compliance with the standard based on the data obtained. This includes all waste codes in First, Second, and Third Thirds where standards for organics in nonwastewaters are based on combustion processes or were transferred from wastes based on combustion processes.

The Agency also points out that in cases where a facility believes that waste-specific treatment standards cannot be met because their laboratory is still unable to achieve detection limits below the treatment standards on specific treatment residuals, and: 1) the facility complies with all the other conditions mentioned above; or 2) a facility utilizes a combustion technology other than incineration or fuel substitution; or 3) a facility utilizes a noncombustion technology that can be demonstrated to be equivalent, the facility may submit a petition for a variance from the treatment standards for that particular waste code (EPA construes 40 CFR 268.44 as encompassing such petitions). The facility must demonstrate that the analyses are in compliance with all other BDAT QA/QC provisions (as outlined in the BDAT General Quality Assurance Project Plan (EPA/530-SW-87-011, March 1987). Moreover, the

COMMENT NUMBER: 1-D-12
DOCKET NUMBER: LD12-00253
COMMENTER: NJ EPA
ISSUE: General BDAT Aspects
SUBISSUE: PQLs
RESPONSE:

petitioner must also demonstrate that the treatment process is a well-designed and well-operated BDAT process.

The Agency acknowledges the commenter's belief that (1) a facility should be required to demonstrate that the PQLs could not be met by at least two other laboratories and that the demonstration should accompany the petition, and (2) a national RCRA laboratory certification program would ensure performance consistency and would facilitate the inter-laboratory studies necessary for better PQL and matrix-specific correction factor development. EPA will take the commenter's concerns into account when developing the guidance on what constitutes "a good faith effort to achieve analytical sensitivity." However, it should be noted the additional laboratory analysis and/or the requirement to use a "nationally RCRA certified laboratory" may place an unnecessary burden on both the regulated and regulatory communities.

Comment Number: 1-D-13
Docket Number: LD12-L0005
Commenter: Kodak
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

Relationship of treatment standards to PQLs.

The Agency states that PQLs are typically significantly lower for treatment residuals such as incinerator ash than for untreated wastes. Most treatment processes destroy not only the hazardous constituents of the waste but also other organics that typically interfere with the analysis for constituents in untreated wastes. The Agency has used the analyses of the treatment residues to develop the treatment standards for this land disposal restrictions program. These standards may be lower than the established PQL for the waste.

The Agency suggests the petition for a variance from the treatment standards option for the wastes for which waste-specific treatment standards cannot be met because the PQL cannot be achieved below the treatment standards. This option provides the generator with non-compliance considerations while the petition is being processed. Since PQLs are highly matrix dependent, Kodak suggests that in situations where the original wastes are tested, the PQLs developed in SW-846 should be allowed as a minimum treatment standard.

COMMENT NUMBER: 1-D-13
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
ISSUE: Kodak
SUBISSUE: PQLs
RESPONSE:

EPA disagrees with the suggestion that PQL's serve as a sort of interior compliance standard. EPA has published its methodology to calculate treatment standards as the detection limit or concentration level (if detected) times the accuracy correction factor times the variability factor. This methodology was published as part of the First and Second Thirds Final Rules. The Agency did not receive any substantial comments concerning the methodology used to calculate the treatment standards.

EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste.

The PQLs in SW-846 were not developed for a specific waste matrix. PQLs are presented for groundwater and low-level soil. Correction

COMMENT NUMBER: 1-D-13 (continued)
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
ISSUE: Kodak
SUBISSUE: PQLs
RESPONSE:

factors are given for other matrices such as high level soil and non-water miscible waste. Correction factors for treatment residuals such as incinerator ash are not given. Detection limits and PQLs are directly related to the constituent of interest and to the amount of interferences that are present in different waste matrices, therefore, detection limits and PQLs are generally significantly lower for treatment residuals than for untreated waste.

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit. Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix. If PQLs were presented for data submitted for this rule, as a factor of the detection limit, then the detection limit information was used to assess the data.

The standards promulgated in the Third Third final rule are derived from detection limits achieved from studies of specific "F" or "K" waste or from the incineration of chemicals listed for specific "U" or "P" wastes or of a similar waste when the treatment standards are transferred. Since the detection limits used to derive the standards are based on the detection limits achieved by the laboratory that analyzed the sample, the

COMMENT NUMBER: 1-D-13 (continued)
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
ISSUE: Kodak
SUBISSUE: PQLs
RESPONSE:

Agency believes that other laboratories can achieve the same detection limits. In cases where more than one set of data were used to develop the treatment standard, the highest detection limit was usually selected as the basis for the treatment standard. Therefore, the resulting treatment standards reflect the best level of analytical performance that is achievable for the waste.

The Agency does not plan to change its methodology for calculating treatment standards. As a result, only information on detection limits and recovery values were evaluated and used to assess the proposed standards. The Agency did not use any information presented in the HWTC study concerning practical quantification limits to recalculate the standards to be promulgated for the U and P waste codes and for multi-source leachate nonwastewaters. In addition, EPA did not reevaluate standards that were promulgated for wastes under the solvents rule, the First Thirds Rule or the Second Thirds Rule.

Several commenters, however, raised the issue that, in certain cases, analytical problems (i.e., difficulties in reliable quantitation at detection limits near the concentration-based treatment standards) may prevent demonstrating compliance with the proposed treatment standards for Third Third wastes. They also pointed out that this same problem already may exist for some First and Second Third wastes.

COMMENT NUMBER: 1-D-13 (continued)

DOCKET NUMBER: LD12-L0005

COMMENTER: Institute of Chemical Waste Management

ISSUE: Kodak

SUBISSUE: PQLs

RESPONSE:

EPA has examined the data submitted to the Agency in support of these comments. While the Agency does not believe that the currently available data is conclusive, EPA acknowledges that there can be situations where lack of available analytical methods may prevent demonstration of compliance with the treatment standards.

EPA is dealing with this potential problem in a number of ways. First, EPA has examined detection limit data submitted by the commenters and compared them to the data used to develop the proposed standards. After a thorough technical evaluation, the Agency incorporated a portion of these data into the promulgated standards in today's rule. In addition, the Agency has reevaluated the existing BDAT data generated by the Agency, the transfer procedures used for some of the wastes, and recently available information and data on recovery of the BDAT organic constituents. Thus, EPA concurred with the commenters and concluded that many of the other proposed concentration-based treatment standards may not be achievable. As a result, EPA is promulgating revised standards for some organics in nonwastewaters that are higher than the proposed standards. In doing so, the majority of the commenters' concerns over achievability are no longer applicable. (Note: The Agency is continuing to study this issue and, if warranted, may adjust other standards, including some for First and Second Third wastes, after sufficient public notice.)

COMMENT NUMBER: 1-D-13 (continued)
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
ISSUE: Kodak
SUBISSUE: PQLs
RESPONSE:

Second, in certain situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT, the Agency has decided that reliance upon the treatability variance petition process would place an unnecessary burden on both the regulated and regulatory communities. The Agency believes that where a waste has been treated with a combustion BDAT process (i.e., incineration or fuel substitution unit), and if the person has made a good faith effort to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

In order to demonstrate compliance in such cases, the person will have had to make a good faith effort to demonstrate that the analyte of concern is not present in the waste at, or above, the treatment standard. To provide a more concrete basis for making such demonstrations, EPA intends to develop and issue guidance on what constitutes a good faith effort to achieve such analytical sensitivity within the next few months. This guidance is anticipated to be available at or near the effective date for the treatment standards.

In developing the treatment standards in today's rule, the Agency selected the treatment data (i.e., detection limit data) that best represented what the majority of wastes could meet. (Note: Most of these data were from incinerator units that were considered well-designed

COMMENT NUMBER: 1-D-13 (continued)
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
ISSUE: Kodak
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RESPONSE:

and well-operated.) However, the Agency rejected detection limit data for some wastes, because the Agency determined that these wastes were not necessarily representative of the treatability of other wastes. After reexamination of all of the available detection limit data, the Agency has found that the majority of the detection limit data for these wastes will generally not exceed the promulgated treatment standards by more than one order of magnitude.

Thus, until this formal guidance is available, the Agency will therefore consider that, if an analytical sensitivity (i.e., detection limit) within an order of magnitude of the treatment standards has been achieved, compliance with the treatment standard will be considered to have been demonstrated provided the data represents the use of a combustion process (i.e., restricted to incineration or fuel substitution in a unit in compliance with all applicable technical operating requirements under 40 CFR 264 Subpart O and 265 Subpart O. Thus, it is likely that the combustion unit is being operated properly). The Agency believes that this is consistent with RCRA section 3304(m), in that, as an alternative to specifying a concentration-based standard for these wastes, the Agency could have promulgated a method of treatment specifying the use of incineration or fuel substitution.

EPA is thus amending section 268.7 and 268.43 to state that where a treatment standard for organics in nonwastewaters is based on a combustion technology, and a waste has been treated using that treatment

COMMENT NUMBER: 1-D-13 (continued)
DOCKET NUMBER: LD12-L0005
COMMENTER: Institute of Chemical Waste Management
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RESPONSE:

method (i.e., restricted to incineration or fuel substitution in units operated in accordance with the technical operating requirements of 40 CFR 264 Subpart O and 265 Subpart O), if a good faith effort has been made to analytically demonstrate compliance with the treatment standard, the treatment facility may certify compliance with the standard based on the data obtained. This includes all waste codes in First, Second, and Third Thirds where standards for organics in nonwastewaters are based on combustion processes or were transferred from wastes based on combustion processes.

The Agency also points out that in cases where a facility believes that waste-specific treatment standards cannot be met because their laboratory is still unable to achieve detection limits below the treatment standards on specific treatment residuals, and: 1) the facility complies with all the other conditions mentioned above; or 2) a facility utilizes a combustion technology other than incineration or fuel substitution; or 3) a facility utilizes a noncombustion technology that can be demonstrated to be equivalent, the facility may submit a petition for a variance from the treatment standards for that particular waste code (EPA construes 40 CFR 268.44 as encompassing such petitions). The facility must demonstrate that the analyses are in compliance with all other BDAT QA/QC provisions (as outlined in the BDAT General Quality Assurance Project Plan (EPA/530-SW-87-011, March 1987). Moreover, the petitioner must also demonstrate that the treatment process is a well-designed and well-operated BDAT process.

Comment Number: 1-D-14
Docket Number: LD12-L0247A
Commenter:
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

Dow Chemical submitted comments (Docket No. 00024) requesting that EPA set a numeric BDAT standard for methanol in U154 wastewaters. Data is provided showing that no methanol was detected in their wastewaters at levels above 0.75 ppm. The fact that no methanol was detected could be related to analytical problems.

The HWTC also provided data on PQLs for nonwastewater treatment residuals. The interlaboratory study performed identified extensive problems with methanol analysis (see page 19 of the HWTC report on "Method Detection Limits and Practical Quantitation Limits for Incinerator Ash Matrices - Interlaboratory Study", January 8, 1990). We are also aware that EPA staff in the Methods Branch is currently developing a method for methanol analysis. For this reason, and as stated in our other comments submitted on January 8 (see Section XIII(A), page 80-81), we feel that EPA should not set any numeric methanol treatment standard, but should only set technology BDAT standard. We therefore urge EPA to finalize the treatment standard for U154 as proposed, on a technology specific basis, since no reliable analytical method exists to determine methanol. For wastewater forms of U154, the concerns of Dow Chemical would be met if EPA also allowed for carbon absorption and biological treatment as a technology specific BDAT standards, as was done for U133, for example.

COMMENT NUMBER: 1-D-14

DOCKET NUMBER: LD12-L0247A

COMMENTER: Hazardous Waste Treatment Council

ISSUE: General BDAT Issues

SUBISSUE: PQLs

RESPONSE:

EPA agrees with the commenter that there are analytical problems associated with analyzing methanol in both wastewater and nonwastewater forms of U154. Therefore, EPA is revising the proposed treatment standards for methanol. EPA will promulgate methods of treatment for both wastewater and nonwastewater forms of U154; incineration or oxidation plus carbon adsorption for wastewaters and incineration for nonwastewaters. EPA decided not to set biodegradation as a method of treatment for any U and P organic (not reactive or ignitable) wastewaters because of concern about unquantifiable bursts of these U and P components disabling the biotreatment unit.

Comment Number: 1-D-15

Docket Number: LD12-L0007

Commenter: Chemical Manufacturers Association

Issue: General BDAT Aspects

Subissue: PQLs

Comment:

The Agency Should Prescribe a Procedure for Obtaining a Variance From a Treatment Standard When Compliance Cannot Be Demonstrated Due to Waste Matrix Interferences.

In section III.A.1.e.(3) of the proposed rule (54 Fed. Reg. at 48,385), the Agency describes the relationship between the practical quantitation limits (PQLs) published in Test Methods for Evaluating Solid Wastes, (SW-846), September 1986, and the BDAT standards, especially those that are based on detection limits. EPA states that when a facility believes that waste-specific treatment standards cannot be met because its laboratory is unable to achieve PQLs below the treatment standards on a specific waste residual, the facility may petition the Agency for a variance from the treatment standards for that particular waste code. CMA does not believe that treatment standards should be set below PQLs. If, however, a facility cannot demonstrate compliance with a BDAT standard because of matrix interferences in its particular waste, then the facility should be able to obtain a variance, and EPA should specify a procedure for obtaining such a variance.

Comment Number: 1-D-15 (Continued)

Docket Number: LD12-L0007

Commenter: Chemical Manufacturers Association

Issue: General BDAT Aspects

Subissue: PQLs

Comment:

CMA has emphasized in previous comments the importance of using a quantitation level, rather than a detection limit, as the basis for enforceable standards. Since compliance with the treatment standards will be assessed by both the waste treater and regulatory agencies, standards that are based on PQLs should account for the expected uncertainties that are inherent to the analytical methods, as well as the limitations presented by matrix-specific interferences.

The problem of demonstrating compliance with treatment standards that are based on detectable levels of hazardous constituents is much greater for characteristic wastes and "P" and "U" wastes, which may exist in a very wide range of matrices such as soils, sludges, or wastewaters. Although the Agency argues that the problems of matrix interference should be reduced for those nonwastewaters that have standards based on incineration, they are not eliminated. Some waste treaters, especially those that are treating characteristic, "P", and "U" wastes, may be unable to achieve BDAT standards that are based on detection limits because of an inability to measure compliance.

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Comment Number: 1-D-15 (continued)

Docket Number: LU 12-L0007

Commenter: Chemical Manufacturers Association

Issue: General BDAT Aspects

Subissue: PQLs

Comment:

If EPA persists in establishing BDAT standards based on detection levels, rather than PQLs, treaters will be required to apply for waste-specific standards. EPA should therefore specify the procedure that is to be used to establish the waste/treatment-specific detection or quantitation limits. CMA recommends the following approach.

- Since it is impractical for most waste treaters to develop an interlaboratory PQL, a quantitation level based on a single-laboratory study by the laboratory that is responsible for demonstrating continued compliance with the standard for the waste in question should be acceptable. CMA believes that the protocol provided in SW-846 for estimating the Method Detection Limit (MDL) should be used to establish the detection (not quantitation) limit for the treated waste matrix. This procedure is an accepted and proven basis for estimating the ability to detect the presence of a chemical in a waste at a 99 percent confidence level. The MDL measured for a specific waste can then be converted to a single-laboratory quantification limit (PQL) by multiplying it by 3.33. This is the relationship between the limit of detection and limit of quantitation that has been recommended by the American

Comment Number: 1-D-15 (Continued)

Docket Number: LD12-L0007

Commenter: Chemical Manufacturers Association

Issue: General BDAT Aspects

Subissue: PQLs

Comment:

Chemical Society in its "Principles of Environmental Analysis" (*Analytical Chemistry*, Volume 55, pages 2210-2218, December 1983). A PQL established in this way represents an uncertainty of plus or minus 30 percent in the measured concentration at the 99 percent confidence level. It should be emphasized that the single-laboratory PQL established by this procedure is more restrictive than the PQLs typically used by EPA, which account for both interlaboratory uncertainty and waste matrix effects.

COMMENT NUMBER: 1-D-15
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EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria, "Minimum" meaning the poorest level of performance that can be considered acceptable (i.e., minimal level of acceptable performance rather than the lowest concentrations of analyte quantifiable. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste. Furthermore, PQL's have no regulatory significance.

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit, such as, the multiplier of 3.33 stated by the commenter as being recommended by the American Chemical Society.

COMMENT NUMBER: 1-D-15 (continued)
DOCKET NUMBER: LD12-L0007
COMMENTER: Chemical Manufacturers Association
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Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix. If PQLs were presented for data submitted for this rule, as a factor of the detection limit, then the detection limit information was used to assess the data.

EPA has implicity assumed that interlaboratory variation in achieving detection limits was small in magnitude compared to the variation in ability to achieve specified detection limits resulting from matrix interference among various samples. The low MDLs achieved by the six labs participating in the HWTC PQL Study, a majority of which fell below EPA's labs' MDLs, confirms this assumption.

EPA is currently (as part of an ongoing process) reevaluating its definition of MDL and may, in future, decide to tie MDLs to PQLs as suggested by the commenter, especially as EPA develops more realistic matrix-specific PQLs. Throughout the time of this rulemaking, EPA has documentation that commercial labs could achieve MDL's well below PQLs, so PQLs generally did not reflect analytical performance routinely achievable.

The Agency does not plan to change its methodology for calculating treatment standards. As a result, only information on detection limits and recovery values were evaluated and used to assess the proposed standards. The Agency did not use any information presented in the HWTC study concerning practical quantification limits to recalculate the standards to be promulgated for the U and P waste codes and for multi-source leachate nonwastewaters. In addition, EPA did not reevaluate standards that were promulgated for wastes under the solvents rule, the First Thirds Rule or the Second Thirds Rule.

Several commenters, however, raised the issue that, in certain cases, analytical problems (i.e., difficulties in reliable quantitation at detection limits near the concentration-based treatment standards) may prevent demonstrating compliance with the proposed treatment standards for Third Third wastes. They also pointed out that this same problem already may exist for some First and Second Third wastes.

EPA has examined the data submitted to the Agency in support of these comments. While the Agency does not believe that the currently available data is conclusive, EPA acknowledges that there can be situations where lack of available analytical methods may prevent demonstration of compliance with the treatment standards.

EPA is dealing with this potential problem in a number of ways. First, EPA has examined detection limit data submitted by the commenters and compared them to the data used to develop the proposed standards. After a thorough technical evaluation, the Agency incorporated a portion of these data into the promulgated standards in today's rule. In addition, the Agency has reevaluated the existing BDAT data generated by the Agency, the transfer procedures used for some of the wastes, and recently available information and data on recovery of the BDAT organic constituents. Thus, EPA concurred with the commenters and concluded that many of the other proposed concentration-based treatment standards may

COMMENT NUMBER: 1-D-15 (continued)
DOCKET NUMBER: LD12-L0007
COMMENTER: Chemical Manufacturers Association
ISSUE: General BDAT Aspects
SUBISSUE: PQLs

not be achievable. As a result, EPA is promulgating revised standards for some organics in nonwastewaters that are higher than the proposed standards. In doing so, the majority of the commenters' concerns over achievability are no longer applicable. (Note: The Agency is continuing to study this issue and, if warranted, may adjust other standards, including some for First and Second Third wastes, after sufficient public notice.)

Second, in certain situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT, the Agency has decided that reliance upon the treatability variance petition process would place an unnecessary burden on both the regulated and regulatory communities. The Agency believes that where a waste has been treated with a combustion BDAT process (i.e., incineration or fuel substitution unit), and if the person has made a good faith effort to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

In order to demonstrate compliance in such cases, the person will have had to make a good faith effort to demonstrate that the analyte of concern is not present in the waste at, or above, the treatment standard. To provide a more concrete basis for making such demonstrations, EPA intends to develop and issue guidance on what constitutes a good faith effort to achieve such analytical sensitivity within the next few months. This guidance is anticipated to be available at or near the effective date for the treatment standards.

COMMENT NUMBER: 1-D-15 (continued)
DOCKET NUMBER: LD12-L0007
COMMENTER: Chemical Manufacturers Association
ISSUE: General BDAT Aspects
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In developing the treatment standards in today's rule, the Agency selected the treatment data (i.e., detection limit data) that best represented what the majority of wastes could meet. (Note: Most of these data were from incinerator units that were considered well-designed and well-operated.) However, the Agency rejected detection limit data for some wastes, because the Agency determined that these wastes were not necessarily representative of the treatability of other wastes. After reexamination of all of the available detection limit data, the Agency has found that the majority of the detection limit data for these wastes will generally not exceed the promulgated treatment standards by more than one order of magnitude.

Thus, until this formal guidance is available, the Agency will therefore consider that, if an analytical sensitivity (i.e., detection limit) within an order of magnitude of the treatment standards has been achieved, compliance with the treatment standard will be considered to have been demonstrated provided the data represents the use of a combustion process (i.e., restricted to incineration or fuel substitution in a unit in compliance with all applicable technical operating requirements under 40 CFR 264 Subpart O and 265 Subpart O. Thus, it is likely that the combustion unit is being operated properly). The Agency believes that this is consistent with RCRA section 3004(m), in that, as an alternative to specifying a concentration-based standard for these wastes, the Agency could have promulgated a method of treatment specifying the use of incineration or fuel substitution.

COMMENT NUMBER: 1-D-15 (continued)
DOCKET NUMBER: LD12-L0007
COMMENTER: Chemical Manufacturers Association
ISSUE: General BDAT Aspects
SUBISSUE: PQLs

EPA is thus amending section 268.7 and 268.43 to state that where a treatment standard for organics in nonwastewaters is based on a combustion technology, and a waste has been treated using that treatment method (i.e., restricted to incineration or fuel substitution in units operated in accordance with the technical operating requirements of 40 CFR 264 Subpart O and 265 Subpart O), if a good faith effort has been made to analytically demonstrate compliance with the treatment standard, the treatment facility may certify compliance with the standard based on the data obtained. This includes all waste codes in First, Second, and Third Thirds where standards for organics in nonwastewaters are based on combustion processes or were transferred from wastes based on combustion processes. The commenter requested that EPA define MDLs and PQLs more precisely than at present: EPA is considering developing such guidance within the next several months. EPA has limited this relief to standards based on combustion because these standards are based on detection limits (times a variability factor) and so are most likely to raise problems relating to detection limits. In addition, the only data submitted to EPA that substantiates interlaboratory detection limit problems (whether called "PQL" problems or by some other name) was a study of incinerator ash submitted by HWTC. This commenter's input has been anecdotal.

EPA believes this procedure is more appropriate than the commenter's suggestion that a facility obtain a variance should matrix interference preclude its verifying compliance with BDAT standards. The commenter's suggestion is essentially open-ended. There is no guarantee that proper treatment (or indeed any treatment) be conducted. EPA frankly would be concerned that the type of open-ended variance advocated by the commenter could encourage less treatment and sloppier laboratory procedures. The limited certification option established in 268.43 (c) meets the commenter's legitimate concerns of accounting for interlaboratory variability when a standard is based on a detection limit, and at the same time largely ensures that prohibited wastes will be properly treated and not improperly analyzed.

The Agency also points out that in cases where a facility believes that waste-specific treatment standards cannot be met because their laboratory is still unable to achieve detection limits below the treatment standards on specific treatment residuals, and: 1) the facility complies with all the other conditions mentioned above; or 2) a facility utilizes a combustion technology other than incineration or fuel substitution; or 3) a facility utilizes a noncombustion technology that can be demonstrated to be equivalent, the facility may submit a petition for a variance from the treatment standards for that particular waste code (EPA construes 40 CFR 268.44 as encompassing such petitions). The facility must demonstrate that the analyses are in compliance with all other BDAT QA/QC provisions (as outlined in the BDAT General Quality Assurance Project Plan (EPA/530-SW-87-011, March 1987). Moreover, the petitioner must also demonstrate that the treatment process is a well-designed and well-operated BDAT process.

Comment Number: 1-D-16
Docket Number: LD12-00032
Commenter: Hazardous Waste Treatment Council
Issue: General BDAT Aspects
Subissue: PQL's
Comment:

I. OBJECTIVE

The primary objective of this study was to determine if the BDAT standards specified in the Land Disposal Restrictions rules are analytically achievable at levels above PQLs for incinerator ash matrices. EPA stated in the preamble to the Third Thirds proposed rule that PQL's for treatment residues, such as incinerator ash, are significantly lower than the PQL's for untreated waste. This statement was contrary to the experience of the incineration industry, which observed that PQLs for incinerator ash are in many cases higher than BDAT standards. Hence, this study was undertaken to determine the validity of the BDAT standards for incinerator ash, considering the unique matrix properties of incinerator ash. Our objective was to determine the appropriate method detection limits and the associated practical quantification limits for incinerator residues, for use in setting alternative BDAT standards for incinerator residues in the First and Second Third restricted waste, and for use in finalizing treatment standards for wastes in the third thirds, and future land disposal restrictions.

The study was designed to comply with EPA's BDAT Quality Assurance Project Plan and to demonstrate that the treatment process were well designed and well operated BDAT processes. The study was a collaborated effort of six commercial incineration companies. Two of the participating laboratories are EPA contract laboratory participants. All of the laboratories routinely utilize EPA performance evaluation standard as part of their QA/QC activities. All methods were in accordance with SW846 protocols.

II. OVERVIEW

The MDL study was initiated in August 1989 following an August 10, 1989 meeting with David Friedman, Chief of the Methods Branch of OSWER, and Jim Berlow, Chief of the Waste Treatment Branch. At this meeting and a subsequent meeting on August 31, 1989 incineration companies presented information showing that 33 out of 91 BDAT standards promulgated for the First and Second thirds were set at levels below practical detection limits. This information was based on individual experiences of the participating companies and it was decided to perform a formalized inter-laboratory study focused on incinerator ash as a matrix.

An initial draft study plan was submitted to EPA's Methods Branch on September 15, 1989 and was finalized October 4, 1989, and incorporated the comments received from EPA. The final EPA approved plan is included as Attachment 4. The rangefinder study was then performed by all six companies, to determine the appropriate spiking levels for each of the constituents. This was done over the period of October 1 through October 30, 1989, and a final report was prepared and submitted on November 7, 1989 (see Attachment 5). Preliminary PQLs were calculated in this final rangefinder report.

Comment Number: 1-D-16 (continued)
Docket Number: L012-00032
Commenter: Hazardous Waste Treatment Council
Issue: General BDAT Aspects
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Comment:

Also, as part of the rangefinder study, a spike was prepared at the BDAT level and analyzed on the ash. The results of that analysis are shown in the attached report. In general, 65 percent of the volatile constituents, 73 percent of the acid extractable constituents and 23 percent of the base neutral extractable constituents were not detected at the spike performed at the treatment standard limit.

Spiking solutions for the detailed MDL/PQL study were prepared by EPA-RTP and sent to each of the participating laboratories. Nathan Malof of EPA-Cincinnati coordinated the preparation of all of the traceable spiking solutions. Calibration standards were checked and validated against the traceable spiking solutions.

The ash samples spiked by each laboratory were the same as described on page one of the attached Rangefinder protocol. The ash samples were all collected in a representative manner by the six participating companies. Details on the sample collection are shown in Attachment G, along with other incinerator operating data demonstrating that the process was well controlled and well operated during sample collection.

The laboratory work for the detailed MDL/PQL study was performed between November 20 and December 20, 1989. This report presents a preliminary report to comply with the early comment requirements for the Third Thirds Proposed rule. This report contains all of the final data from the study, and only lacks the backup material, such as the supporting data package, chromotograms, etc. These will be provided by January 8, 1990.

Comment Number: 1-0-16 (continued)
Docket Number: L012-00032
Commenter: Hazardous Waste Treatment Council
Issue: General BDAT Aspects
Subissue: PQL's
Comment:

III. PROCEDURE FOR METHOD DETECTION LIMIT STUDY

A. General

The method detection limit is defined as the minimum concentration of a substance that can be identified, measured and reported with 99% confidence that the given analyte concentration is greater than zero and determined from analysis of a sample in a given matrix containing the analyte. The procedures used in this study protocol was designed for applicability to the ash matrix and were influenced by the results of the rangefinder study (see Attachment 5). An overall MDL Study Plan was submitted to EPA Headquarters, Methods Branch on October 4, 1989, and was reviewed and approved by David Friedman, Branch Chief.

As a result of the rangefinder study, an estimation of the detection limit for all BDAT analytes was made. This estimation was used to identify proper spiking levels and to ensure that the spiked levels for all BDAT constituents would be fairly close to the statistically derived Method Detection Limit (MDL).

After spiking levels were established and approved by representatives from the EPA Office of Solid Waste, ampulated cocktail solutions were prepared at the appropriate concentrations. These cocktails were prepared by the EPA, Quality Assurance Materials Branch, Research Triangle Park, North Carolina, to ensure that the concentrations were traceable.

B. Volatiles

See attached "Definition of Procedures for the determination of volatile organics in ash matrices using micro-dilution/extraction techniques" for full details relating to the study protocol (see Attachment 1). The ampulated cocktail solutions prepared by the EPA were used for both instrument calibration and spiking.

Comment Number: 1-D-16 (continued)
Docket Number: LD12-00032
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C. Semivolatiles

Sample preparation techniques generally followed the procedures defined in "Definition of procedures for the determination of method detection limits in the incinerator ash matrix-interlaboratory study; (see Attachment 4) with two exceptions. First, the spiking protocols for the ash were standardized based on Agency recommendations to incorporate air drying of the ash prior to extraction by soxhlet. (See Attachment 2 - Semivolatiles - Spiking and Drying Procedure). Secondly, initial and continuing calibrations were performed with calibration cocktails that were different from the spiking solutions. This difference was due to the varying concentration levels and potential saturation of the mass spectrometer due to analytes spiked at high levels. It was agreed upon by the HWTC Analytical Subcommittee and the EPA, Office of Solid Waste representatives that ampulated cocktail solutions for the CERCLA target compounds (Prepared by EPA, Quality Assurance Materials Branch) that the committee would contract Accustandard to prepare ampulated solutions for the remaining semivolatile BDAT analytes. In addition, five-point calibration curves were generated for all semivolatile analytes and the criteria was evaluated against SW-846 method 8270. Continuing calibrations were allowable, provided that they met all method 8270 criteria.

IV. RESULTS OF METHOD DETECTION LIMIT STUDY

The results of the study are summarized in the tables in this section. The methods for reduction of data were agreed to in the approved study plan and during the December 8, 1989 meeting with Barry Lesnick of EPA's Methods Branch.

Practical Quantitation Limits (PQLs) are calculated using the following formula:

PQLs = 5 x MDL x Accuracy Adjustment Factor

The accuracy adjustment factor is equal to 100 divided by the percent recovery on the ash matrix.

PQLs are tabulated for each individual laboratory, with the average PQL of all laboratories presented. In addition, all 42 replicate analyses of the six laboratories were pooled together and a combined PQL based on 42 replicates calculated. These are tabulated in the tables that follow along with minimum and maximum BDAT standards. Summaries of each individual laboratories replicate analysis for volatiles and semivolatiles are provided in Attachment 8.

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1.0 INTRODUCTION

The Agency has used the method detection limit study submitted by the Hazardous Waste Treatment Council (HWTC) to the Agency during the comment period for the Land Disposal Restrictions Rule for Third Third Scheduled Wastes to evaluate whether industry's laboratories can reliably quantify regulated constituents at the level of both the proposed and previously promulgated concentration-based standards established for U and P waste codes. These concentration-based standards are based on incineration ash data from 14 incineration studies conducted by the Agency, specifically, for the Land Disposal Restrictions Program.

The intent of HWTC's study was to verify whether industry's laboratories could routinely quantify the constituents regulated for U and P waste codes and to identify the constituents which could not be quantified at the proposed or promulgated concentration-based standards. The HWTC study consisted of spiking the regulated constituents in samples of incineration ash at levels near the concentration-based standards and analyzing the samples using SW-846 methods, specifically the micro extraction technique for volatile organics followed by Method 8240 and soxhlet extraction for the semivolatile organics followed by Method 8270. The study was conducted at six laboratories. Each laboratory analyzed seven replicates to determine the method detection limit and seven spiked samples to determine the recovery values for each constituent. The study included information on method detection limits

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and recovery values. In addition, HWTC calculated treatment standards using their methodology, which is based on practical quantification levels (PQLs) for each constituent. HWTC arbitrarily defined PQLs as a value five times the method detection limit. EPA reiterates that PQLs are minimum measures of analytical laboratory performance, as defined in SW-846, for the use of laboratories in assessing their own performance in terms of success in reaching low levels of certain analytes in certain matrices. Outside of this function of providing a quantitative definition of the boundaries between poor and competent analytical performance, PQLs have no regulatory power.

2. Limitations in the Commentor's Data

Although HWTC did conduct a comprehensive method detection limit study for most of the BDAT constituents regulated in the Third Thirds Rule as well as the First and Second Thirds Rules, the documentation submitted to EPA as part of the comment omitted, the following items thereby limiting the usefulness of the study:

- Although the six laboratories analyzed seven replicates to determine the method detection limits, data were only presented for the average from each laboratory and the pooled average value calculated from all of the data points submitted by the individual laboratories. As a result, EPA could not evaluate the precision each individual laboratory achieved for determining the detection limits nor could the range of detection limits associated with each set of replicates be examined. Therefore, EPA could not compare the precision of the HWTC data relative to EPA's and as a

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result could not assess HWTC's comments concerning detection limit precision.

- Characterization data for the untreated waste that was used to generate the incinerator ash used by a laboratory participating in this study were not available. As a result, EPA could not assess the incinerator burns to determine whether substantial treatment of the waste occurred or whether the ash was obtained from a waste that is more or less representative of the waste in question than the ash EPA analyzed to set its standards on.

- The measurable levels of both volatile and semivolatile organic constituents present in the unspiked ash suggest inadequate incinerator time or temperature and thus the ash may have been generated from incinerators that were not well-operated or well-designed. The presence of these volatile and semivolatile constituents at measurable quantities in the unspiked ash may also indicate that additional matrix dependent interferences may have been present in the samples used for this study by some of the participating laboratories.

- Incinerator process documentation provided in the study was inadequate to assess whether the incinerators used to generate the ash were well-designed and operated. HWTC did provide primary and secondary chamber combustion temperatures, combustion chamber carbon monoxide content, combustion gas velocity, feed rate, halogen content, and ash content in its comment submitted to the November 22, 1989 proposed standards. The names and addresses of the incinerators generating the ash used in HWTC's study were also given. Some of them were used in several of EPA's own 14 test burns. The six incinerators participating in this study were identified as five rotary kiln incinerators and one multiple hearth incinerator. The limited process data available in the report were presented as ranges plus averages. No data on length of burn, graph charts recording the operating parameters during the incineration burns, or flow sheets of the incineration system were given. In addition, no information was provided on either

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the sampling point where the ash was collected or the sampling procedures used to collect the ash samples; therefore, EPA could not compare these data with the data collected from the 14 test burns conducted by EPA.

3. Commenter's Procedures Affecting Numerical Value of Detection Limits

In addition, the HWTC study used different preparation methods before analyzing the samples than those used in EPA's 14 incineration studies. For volatile organics, the HWTC study used the micro extraction technique prior to analysis by SW-846 Method 8240, whereas the EPA incineration test burns used the purge and trap method prior to analysis by SW-846 Method 8240. For semivolatile organics, the HWTC study used soxhlet extraction prior to analysis by SW-846 Method 8270, whereas the EPA incineration studies used sonication prior to analysis by SW-846 Method 8270. One difference between the preparation methods used by HWTC study versus EPA's incineration burns was the sample size used in the analysis. For volatile organics, HWTC used 4 grams of sample in the micro extraction technique versus 5 grams used for purge and trap extraction. For semivolatile organics, HWTC used 10 grams for the soxhlet extraction versus 30 grams used for the sonication extraction. This difference in sample size made it difficult to compare the data from the two sources. Due to the smaller sample size used in the HWTC study, the detection limits calculated in the study would be higher than those achieved in the 14 incineration test burns conducted by EPA. Table 1 presents the detection limits reported in the 14 incineration studies and

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the average detection limit reported for each of the six laboratories that participated in the HWTC study as well as their pooled detection limit that was calculated as the average from all of the data generated by the six laboratories.

4. Evaluation-of Apparent Discrepancies Between Commenter and EPA Data

EPA also examined the recovery values presented in the HWTC study that were generated by the six laboratories from the analysis of seven replicates for each constituent. EPA used these data to reevaluate the proposed standards. If these recovery values were outside a range of 20 to 200 percent for over half of the data presented then the standards for that specific analyte were reexamined. For some analytes, the HWTC data indicated that a specific laboratory may have had a problem with matrix interferences with specific parts of the chromatograms since reported detection limits were significantly higher than the detection limits reported by the other participating laboratories and the recovery values were also not consistent with the data available from the other laboratories. These matrix interferences could be due in part to the waste that was used to generate the ash or to the incomplete combustion of the ash as supported by the concentration levels of various constituents in the unspiked ash. Table 2 summarizes the recovery values reported in the HWTC study.

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EPA did not review any standards that were not in the proposed Third Third Rule, specifically, those that were promulgated in the First Third and Second Third Rule and the Solvent Rule. Changes occurred primarily when EPA reevaluated cases where the HWTC study reported higher detection limits than those used by EPA to calculate standards. Although EPA had generally used the highest of the set of up to 14 incineration ash detection limits as the basis of the proposed standards, some exceptions had been made in the case of outliers and in cases where EPA believed a particular raw waste matrix best represented the waste code in question. In reviewing the HWTC study information, EPA reexamined those exceptions where the detection limit fell significantly below HWTC's reported detection limits and where there were anomalously high or low recoveries.

EPA had also published a report entitled "USEPA Method Study 36: SW-846 Methods 8270/3510 GC/MS Method for Semivolatile Organics: Capillary Column Technique; Separatory Funnel Liquid-Liquid Extraction," EPA/600/S4-89/010. This study documents analytical problems with several analytes for which Third Thirds standards were proposed. These analytes also were noted as problems in the HWTC study. HWTC also presented the results of this study in their comment.

Table 3 summarizes the BDAT list constituents for which numerical standards were proposed for either U and P waste codes or for multi-source nonwastewaters. This table also summarizes the analytes which were reevaluated as a result of detection limit or recovery

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problems as presented in the HWTC's comment or with analytical problems as reported in EPA's "Method 36 Study."

Based on all the information evaluated from the HWTC study and EPA's Method 36 Study, and the 14 incineration test burns, the standards for the compounds listed in Table 4 were changed from the proposed rule. Below is the explanation of why these standards were changed.

Concentration-based standards for twelve U and P constituents (acetone, chloromethane, 4,4'-methylene bis(2-chloroaniline) 1,4-dioxane, ethyl acetate, ethyl ether, methyl ethyl ketone, N-nitrosopiperidine, N-nitrosopyrrolidine, 5-nitro-o-toluidine, N-nitrosodi-n-butylamine, and acrylonitrile) were revised to reflect detection levels in different wastes because the matrices used to generate the proposed standards were ash from burns of phthalate waste (K024), disulfoton wastes (K037), acetonitrile/acrylonitrile wastes (K011, K013, and K014), all unique matrices. Acetone, chloromethane, 1,4-dioxane, ethyl acetate, acrylonitrile, ethyl ether, and methyl ethyl ketone are volatile organics while K024 and K037 raw wastes, from which proposed standards for some of these compounds were derived, are high in semivolatile compounds such as PNA's. The acetonitrile/acrylonitrile wastes (K011, K013, and K014) contain volatile organics; however, it is considered a unique matrix that may not be appropriate for transfer for U and P waste codes. EPA chose to base the promulgated standards on a matrices such as incineration ash from wood-preserving wastes (K001-PCP and creosote), from ethylene

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dichloride and other mixed wastes (K019 incineration test), or from veterinary pharmaceutical wastes (K102) because these are complex matrices with high concentrations of many organic compounds: volatiles, semivolatiles, chlorinateds, and others, and, consequently, are particularly difficult to analyze so that detection limits from these compounds are particularly achievable for U and P wastes and multi-source leachate nonwastewaters.

N-nitrosopiperidine, N-nitrosopyrrolidine, 5-nitro-o-toluidine, 4,4'-methylene bis(2-chloroaniline), and N-nitrosodi-n-butylamine proposed standards came from the phthalates (K024) waste matrix; the promulgated standards derive from detection levels found in the wood preserving waste (K001-PCP) burn, whose value as a source of data is discussed above.

Because the detection limits reported in the HWTC study for vinyl chloride lies well above the detection limit EPA used to develop a concentration-based standard for this waste, EPA is promulgating a higher concentration-based standard. The promulgated standard for vinyl chloride reflects the choice of a different and higher detection limit, this one from the ethylene dichloride (K019) waste matrix.

For acrolein, acetonitrile, 3, 3'-dichlorobenzidine, p-dimethylaminoazobenzidine, chlorobenzilate, 2-naphthylamine, and cyclohexanone, the commenter reported such drastic detection limit

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discrepancies and/or extreme recoveries that EPA believes these analytes belong in the category of those not amenable to quantification in nonwastewaters. Therefore, a treatment method will be promulgated instead of a revised concentration-based nonwastewater treatment standard.

For 2-chloro-1,3 butadiene, the commenter reported zero recoveries for several sets of replicates and extremely variable recoveries for another. EPA's own experience in quantifying 2-chloro-1,3 butadiene led the Agency to promulgate a method of treatment for 2-chloro-1,3 butadiene rather than a concentration-based standard as proposed.

The Third Thirds proposed rule had solicited comment on whether benzal chloride in waste treatment residual matrices could be routinely quantified. The Agency had believed that benzal chloride was too unstable in water to be routinely quantified. No specific information demonstrating successful measurement of benzal chloride were submitted during the comment period. EPA is thus promulgating incineration as a technology-based standard for benzal chloride for U017 and multi-source leachates nonwastewaters due to its instability in water instead of the proposed concentration-based standard. Note that EPA is promulgating as proposed the concentration-based standard for benzal chloride as a constituent of K015 since EPA has analytical data for untreated K015 waste and thus for the treatment residues from incineration of K015.

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EPA also changed several standards in response to information in a recently released EPA Office of Research and Development (ORD) study, EPA/600/S4-89-010, "USEPA Method Study 36: SW-846 Methods 8270/3510 GC/MS Method for Semivolatile Organics: Capillary Column Technique; Separatory Funnel Liquid-Liquid Extraction," (hereafter referred to as EPA's Method Study 36). This study evaluates the analytical methods most commonly used to quantify semivolatile analytes. "Semivolatiles" are a category of organic chemical including more than half of the compounds regulated in this rule. Although this study was carried out in support of the RCRA ground-water monitoring regulations and consequently looked only at aqueous matrices rather than at the incinerator ash matrices used to develop these nonwastewater concentration-based standards, the study documents such serious analytical problems with several Third Thirds analytes that EPA has chosen to promulgate incineration as a treatment standard rather than the proposed concentration-based standards. These analytes are: aramite, benzenethiol, phthalic anhydride, dibenzo(a,e) pyrene, dibenzo(a,i)pyrene, p-benzoquinone, hexachlorocyclopentadine, hexachlorophene, 1,4-naphthoquinone, 1-naphthylamine, N-nitrosodimethylamine, pentachloroethane, resorcinol, and tris(2,3-dibromophosphate).

This study determined how reliably these analytes can be quantified in aqueous matrices by examining the recoveries obtained and the precision achieved over the course of multiple analyses by several laboratories. Statistical analysis indicated that the recovery data for the analytes listed above were so unrealistically high or low that EPA,

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in the study, has declined to recommend the use of SW-846 methods 3510/8270 for quantifying these analytes in ground-water monitoring at RCRA-permitted facilities.

In promulgating the Third final rule, EPA chose to incorporate this recommendation about the severity of the problems associated with SW-846 methods 3510/8270 and thus move these analytes into the category of those compounds to be regulated with technology-based standards. The reason for this decision is that the study documents significant problems with GC/MS (gas chromatography/mass spectrometry which is the technique used almost exclusively to quantify organic compounds in all environmental samples and which is the basis not only of SW-846 8270, but of most other SW-846 methods for organic analytes) which are common to most methods used to quantify these compounds.

However, EPA makes one exception to its decision to promulgate methods as standards for those analytes recommended for deletion from methods 3510 plus 8270 in this ORD study. Since EPA has specific analytical data on the incineration of Dinoseb and since the data was of sufficient QA/QC, EPA is promulgating the concentration-based Dinoseb standards as proposed.

In reviewing its own data, EPA also decided that inadequate documentation exists demonstrating successful quantification of cis- and trans-1,2-dichloro-3-butene. Considering this, together with the

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problems in quantifying these two as a pair because their widely different boiling points complicate their behavior in the GC/MS apparatus, EPA is promulgating incineration as a method rather than the proposed concentration-based standard.

As noted earlier, The HWTC comment also included calculations of treatment standards based on PQLs. In the HWTC comment, PQLs were defined as five times the method detection limit. HWTC's methodology to calculate treatment standards is the PQL times the accuracy-correction factor (as calculated from the average recovery values) times the variability factor. EPA has published its methodology to calculate treatment standards as the detection limit or concentration level (if detected) times the accuracy correction factor times the variability factor. This methodology was published as part of the First and Second Thirds Final Rules. The Agency did not receive any substantial comments concerning the methodology used to calculate the treatment standards.

In addition, EPA used the definitions for method detection limit and practical quantification limits as published in the proposed revisions to the September 1986 edition of Test Methods for Evaluating Solid Waste (also referred to as SW-846). In this document the Agency defined method detection limit as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero." Practical quantification limits (PQLs) are defined as "the lowest level of qualification that the Agency believes a competent laboratory can be expected to reliably achieve."

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The PQLs published in SW-846 were established to provide a guidance for the analysis of waste samples by acting as minimum performance criteria. Thus, PQLs do not necessarily represent the lowest limits of analytical performance achievable for any given waste. Detection limits are the lowest limit that can be quantified for a given constituent in a given waste.

The PQLs in SW-846 were not developed for a specific waste matrix. PQLs are presented for groundwater and low-level soil. Correction factors are given for other matrices such as high level soil and non-water miscible waste. Correction factors for treatment residuals such as incinerator ash are not given. Detection limits and PQLs are directly related to the constituent of interest and to the amount of interferences that are present in different waste matrices, therefore, detection limits and PQLs are generally significantly lower for treatment residuals than for untreated waste.

In some cases detection limits and PQLs by their definition in SW-846 can be equal since detection limits are the lowest level that can be quantified for a constituent and PQLs are defined as the lowest level that can be achieved reliably. PQLs are not defined as a factor or multiple of the detection limit. Therefore, data can be reported below a PQL level. Data should not be reported below the detection limit achieved for the specific constituent for a specific matrix. If PQLs were presented for data submitted for this rule, as a factor of the

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detection limit, then the detection limit information was used to assess the data.

The standards promulgated in the Third Third final rule are derived from detection limits achieved from studies of specific "F" or "K" waste or from the incineration of chemicals listed for specific "U" or "P" wastes or of a similar waste when the treatment standards are transferred. Since the detection limits used to derive the standards are based on the detection limits achieved by the laboratory that analyzed the sample, the Agency believes that other laboratories can achieve the same detection limits. In cases where more than one set of data were used to develop the treatment standard, the highest detection limit was usually selected as the basis for the treatment standard. Therefore, the resulting treatment standards reflect the best level of analytical performance that is achievable for the waste.

The Agency does not plan to change its methodology for calculating treatment standards. As a result, only information on detection limits and recovery values were evaluated and used to assess the proposed standards. The Agency did not use any information presented in the HWTC study concerning practical quantification limits to recalculate the standards to be promulgated for the U and P waste codes and for multi-source leachate nonwastewaters. In addition, EPA did not reevaluate standards that were promulgated for wastes under the solvents rule, the First Thirds Rule or the Second Thirds Rule.

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The HWTC comment also included a qualitative discussion of problematic volatile and semivolatile compounds in Tables V-1, V-2, VI-1, and VI-2. EPA assessed these comments when the standards for the U and P waste codes were reevaluated for the final rule. Below is the discussion concerning each of the constituents listed on these tables.

For acetone, HWTC stated that high water solubility and low extraction and purging efficiency were experienced during the analysis and that this constituent is a common laboratory contaminant. Data for recoveries did not support this claim since only 14 data points were outside the range of 20-150 percent recovery. One laboratory may have had problems with their spiking techniques for this compound since for two of the replicates it achieved 64 and 72 percent recoveries and for the remaining five replicates it had zero percent recovery. Detection limits ranged from 0.8 to 5 for all six laboratories. EPA evaluated its own data and had a range of detection limits of 0.05 to 50. During the proposed rule, the standard was based on the incineration of K011, K013, and K014, because this waste had the highest concentration of acetone in the conducted waste. However, the matrix for U002 and multi-source leachate nonwastewaters may be more difficult to treat and analyze than K011, K013, and K014 wastes, which primarily contain volatile organism. Therefore, the Agency has decided to select the highest detection limit from the 14 incineration test burns and its associated recovery value to calculate the nonwastewater treatment standard.

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For acetonitrile, HWTC stated that high water solubility and low extraction and purging efficiency were experienced during the analysis. HWTC also reported poor recovery efficiencies for most of the samples spiked. In EPA's 14 incineration studies, the detection limits vary from 0.1 to 200. Because of this high analytical variability, EPA has chosen to set a treatment method in the final rule instead of a concentration-based or numerical nonwastewater treatment standard for this constituent.

For acrolein, HWTC stated that high water solubility and its tendency to polymerize in the presence of polar solvents or light contributes to poor extraction and purging efficiencies. HWTC also encountered poor recovery efficiencies for most of the samples spiked. In EPA's 14 incineration studies, the detection limits vary from 0.1 to 500. Because of this high variability, EPA has chosen to set a treatment method in the final rule instead of a concentration-based or numerical nonwastewater treatment standard for this constituent.

For acrylonitrile, HWTC stated that high water solubility caused analytical problems; however, recovery values for this compound were between 20 and 150 percent for 37 of the 42 spiked samples analyzed. These recoveries do not support HWTC's comments concerning analytical problems. In EPA's 14 incineration studies, the detection limits vary from 0.1 to 30. As a result, EPA has chosen to promulgate a concentration-based or numerical nonwastewater treatment standard. The revised

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concentration-based standard is based on the detection limits from the incineration of K102 (veterinary pharmaceutical wastes) which is a more difficult waste to treat and analyze than the waste from K011, K013, and K014 (acetonitrile/acrylonitrile waste) that contains primarily volatile organics.

For 2-chloro-1,3-butadiene, HWTC stated that a commercial standard was unavailable in neat form and that the standard provided by EPA was made up in xylene and therefore unusable. However, HWTC did provide recovery data for this constituent. The recovery value for three laboratories were zero for all of their replicates and for the other three the results were less than 20 percent for 5 of the 21 replicates analyzed. Since a numerical standard was not proposed for a U or P waste code and in light of the analytical problems associated with this compound in the data presented by five of the six laboratories in the study, the Agency decided to promulgate a treatment method instead of a concentration-based or numerical nonwastewater treatment standard.

For chloroethane, HWTC stated that it is extremely volatile, difficult to trap using purge and trap methods, difficult to separate from the carrier gas in the jet separator and quickly lost from the analytical standard. However, HWTC used the micro dilution technique to prepare the volatile organics instead of purge and trap and obtained recovery values between 20 and 150 percent for 30 of the 42 replicates, thereby indicating that this compound can be routinely analyzed.

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Therefore, the Agency will promulgate a concentration-based or numerical nonwastewater treatment standard for this constituent.

For 2-chloroethyl vinyl ether, HWTC stated that it is quickly lost from analytical standards. However, EPA did not propose a concentration-based or numerical standard for either U or P waste codes or for multi-source leachate; therefore, there were no numerical nonwastewater treatment standards to reevaluate.

For cyclohexanone, HWTC stated that high water solubility caused analytical problems. EPA reevaluated the Agency's limited data and the HWTC data and decided not to promulgate a concentration-based nonwastewater treatment standard. A treatment method will be promulgated as BDAT for this constituent for the nonwastewaters.

For chloromethane, HWTC stated that it is extremely volatile, difficult to trap using purge and trap methods, is difficult to separate from the carrier gas in the jet separator, and is quickly lost from analytical standard solutions. Two laboratories had spike recoveries between 58 and 129 percent. One laboratory had recoveries between 10 and 21 percent and three laboratories had zero recoveries. Insufficient information is available to determine whether procedural problems occurred at the four laboratories or whether matrice problems caused the low recoveries. The Agency believes that this constitutent can be analyzed routinely at the proposed BDAT levels, therefore, a

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concentration-based nonwastewater treatment standard will be promulgated for this constituent.

For 1, 2-dibromo-3-chloropropane, HWTC stated that it polymerizes, is light sensitized, and is difficult to recover. HWTC's data does not fully support this claim. Four laboratories achieved recoveries of 35 to 125 for their replicates. The two remaining laboratories did have recovery problems - one had zero recovery for all the replicates and one had recoveries greater than 200 percent for six replicates and zero for one. Sufficient documentation is not available to determine why these two laboratories had recovery problems. The Agency believes that this constitutent can be analyzed routinely and will promulgate a concentration-based nonwastewater treatment standard.

For trans-1,4-dichloro-2-butene, HWTC stated that the compound eludes late on the capillary column and is difficult to separate from column bleed. The compound is difficult to detect as a volatile compound on a packed column. EPA reviewed its data for both the cis and trans isomers. Based on the difficulty in analyzing the cis isomer and the limited data available for the trans isomer, EPA has decided to promulgate a treatment method for the nonwastewaters.

For dichlorodifluoromethane, HWTC stated that the compound is extremely volatile, difficult to purge, difficult to separate from the carrier gas and quickly lost from analytical standard solutions. EPA

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evaluated HWTC's data. HWTC's detection limits, ranged from 0.2 to 4.9, whereas, EPA's ranged from 0.01 to 10. HWTC's recovery values were generally low, however, 20 of the 42 values were within the 20 to 150 percent range. The Agency believes that the constituent can be routinely analyzed and will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For 1,4-dioxane, HWTC stated that high water solubility caused analytical problems. HWTC did not report recovery values for this compound. Based on a comparison of detection limits, HWTC's detection limits ranged from 1.2 to 6.0, which was well within EPA's detection limits which range from 0.2 to 60. The Agency believes that the constituent can be routinely analyzed and will promulgate a concentration-based nonwastewater treatment standard.

For ethyl acetate, HWTC had detection limits that were greater than the proposed standard. EPA reevaluated its data and determined that the range of detection limits for EPA's data was 0.02 to 10 and HWTC's detection limits ranged from 2.3 to 7.5. As a result, EPA reevaluated the data used to transfer the standard and determined that the data from K001 with a detection limit of 10 would be a more appropriate matrix from which to transfer the data than from the K024 data used for the proposed standard. Therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

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For ethyl cyanide, HWTC stated that high water solubility caused analytical problems. HWTC's recovery does not support this statement since over half the data for recovery is between 20 and 150 percent. One laboratory did encounter problems since it had zero recoveries for all replicates, however, insufficient documentation is available to determine the source of the problem. Also one laboratory had consistently high results (155 to 247 percent). Again insufficient documentation is available to determine the source of the problem. As a result, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For ethyl ether, HWTC stated that high water solubility caused analytical problems. HWTC's data does not support this statement since for five of the laboratories that recovery data are between 20 and 150 percent for 34 of the 35 data points. One laboratory had consistently low results but insufficient data are available to determine the source of the problem. As a result, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For methyl ethyl ketone (2-butanone), HWTC stated that high water solubility caused analytical problems. HWTC's recovery data does not support this statement. Over half of the recovery data presented for methyl ethyl ketone is between 20 and 150 percent. The Agency believes that this constituent can be routinely analyzed, therefore, a concentration-based nonwastewater treatment standard will be promulgated for this constituent.

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RESPONSE:

For methacrylonitrile, HWTC stated that high water solubility caused analytical problems. HWTC's recovery data does not support this statement. Over half of the recovery data presented for methacrylonitrile is between 20 and 150 percent. The Agency believes that this constituent can be routinely analyzed, therefore, a concentration-based standard will be promulgated for this constituent for nonwastewaters.

For methylene chloride, HWTC stated that it is a common laboratory contaminant resulting in high background concentration which is not possible to correct consistently in blanks. The background variability is not reproducible because of extreme variability. The Agency agrees that methylene chloride is a common laboratory contaminant at very low levels. The Agency believes that good laboratory practices can reduce the presence of methylene chloride to less than a few parts per billion in the blanks, and should not cause high background contamination levels. Therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For 2-nitropropane, HWTC stated that it is extremely volatile, difficult to purge using purge and trap methods, difficult to separate from the carrier gas, and quickly lost from analytical standards. In addition, it has a poor response to the mass spectrometer due to major fragment ions being below the amu scan range. EPA agrees that there are analytical difficulties associated with analyzing this constituent in nonwastewater matrices, therefore, for the U and P waste codes and

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RESPONSE:

multi-source leachates the Agency proposed a treatment method as the nonwastewater standard for the constituent. Therefore, EPA will not revise its proposed nonwastewater treatment standard for this constitutent.

For vinyl chloride, HWTC stated that it is extremely volatile, difficult to purge using purge and trap methods, difficult to separate from the carrier gas, and quickly lost from analytical standards. In addition, HWTC's detection limits were significantly below the proposed treatment standard. As a result, EPA reevaluated the treatment since the detection limits for all of the incinerator burns ranged from 0.01 to 10. The Agency believes that this constituent can be routinely analyzed and HWTC's recovery data support this since over half of the recovery data are between 20 to 150 percent. The Agency will promulgate a concentration-based nonwastewater treatment standard based on a more suitable waste to be used to transfer the treatment performance.

For acetophenone, EPA plans to promulgate the proposed standard. EPA evaluated the HWTC and the detection limits for five of the six laboratories were below the proposed treatment standard. In addition, only two of the 42 recovery values were outside a range of 28-95 percent. EPA believes that laboratories can analyze ash at the level set for the treatment standard. Therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

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RESPONSE:

For 4-aminobiphenyl, HWTC states that there were poor chromatography due to absorption on the column due to the extreme polarity of the compound. EPA believes that this constituent can be analyzed, however, since this constituent is not a U or P waste code and based on the limited data available, EPA has decided to promulgate a method of treatment as the nonwastewater standard for multi-source leachates.

For aniline, HWTC stated that the compound is highly volatile resulting in loss during sample preparation and no final approved method is available in SW-846 with no precision and accuracy statement. Based on the data available for detection limits from both the HWTC study and EPA's test burns, EPA believes that this constituent can be analyzed at the level of the proposed treatment standard. Therefore, EPA will not revise its proposed nonwastewater treatment standard for this constituent.

For aramite, HWTC stated that the constituent has poor chromatography and low response. EPA's Method 36 Study stated that aramite was not amenable to analysis by SW-846 Method 8270. As a result, EPA will promulgate a method of treatment as a nonwastewater treatment standard for this constituent.

For benz(a)anthracene and chrysene, EPA's detection limits ranged from 0.33 to 2.0 for benzo(a)anthracene and 0.17 to 2.0 for chrysene, the K001 creosote test burn and K087 test burn for which both wastes contain PAHs and had detection limits of 0.5 and 1.0, respectively. HWTC

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reported detection limits of 25.6 to 313 for benzo(a)anthracene and 42.5 to 336.0 for chrysene. The recovery data for these constituents were adequate. Based on an evaluation of data for all of the polynuclear aromatic hydrocarbons (PAHs), the detection limit for benzo(a)anthracene and chrysene should be approximately three times higher than the detection limits for fluoranthene (2.0 to 37.7 reported in the HWTC study). HWTC's data for benzo(a)anthracene and chrysene are greater by over a magnitude from these data for fluoromethane. This suggests that there were interferences present in the part of the spectrum containing benzo(a)anthracene and chrysene. Based on an evaluation of EPA's data which showed substantial treatment of this constituent based on the data available for K001-creosote and K087 and for HWTC's data for fluoranthene, concentration-based nonwastewater treatment standards for benzo(a)anthracene and chrysene will be promulgated.

For benzenethiol, HWTC stated that the constituent is unstable in polar solvents. EPA's Method Study 36 stated that there were analytical problems associated with this constituent. Therefore, EPA has chosen to set a treatment method for this constituent in the final rules instead of a concentration-based on numerical nonwastewater treatment standard.

For benzidine, HWTC stated that the constituent oxidized during sample preparation, had poor chromatography, generated erratic results, and thermally degrades upon injection. EPA recognized the analytical problems associated with the constituent and proposed a treatment method

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RESPONSE:

as the standard, therefore, EPA will not revise the proposed nonwastewater standard for this constituent.

For benzo(a)pyrene, benzo(g,h,i)perylene, and benzo(k)fluoranthene, HWTC stated that the standards for these compounds were not available commercially. EPA believes that these constituents are available from suppliers of analytical standards, especially since standards were available for EPA's 14 incineration test burns. Therefore, EPA will promulgate concentration-based nonwastewater treatment standards for these constituents.

For p-benzoquinone, HWTC stated that the constituent is subject to oxidative loss during extraction. EPA's Method Study 36 stated that there were analytical problems associated with p-benzoquinone. Therefore, EPA has chosen to set a treatment method for this constituent in the final rule instead of a concentration-based or numerical nonwastewater treatment standard.

For bis(2-chloroethoxy)methane, the detection limits for the HWTC study ranged from 0.5 to 2.8 for five of the six laboratories and 8.3 for one laboratory. The detection limit for EPA's data ranged from 0.17 to 2.0. Therefore, EPA believes that incinerator ash can be analyzed at the proposed level for this constituent. Therefore, EPA will not revise its nonwastewater treatment standard for this constituent.

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RESPONSE:

For 2-sec-butyl-4,6-dinitrophenol (Dinoseb), HWTC stated that the constituent is highly acidic and subject to absorptive loss during preparation and chromatography. However, for this constituent, EPA has specific analytical data on the incineration of Dinoseb. Therefore, as stated earlier, EPA will promulgate a concentration-based for Dinoseb nonwastewater treatment standard as proposed.

For chlorobenzilate, HWTC reported, as stated earlier, that there were detection limits and recovery problems. The Agency believes that this constituent belongs in the category of those not amenable to qualification. Therefore, a treatment method will be promulgated instead of a revised concentration-based nonwastewater treatment standard.

For p-chloro-m-cresol, HWTC stated that the constituent had erratic chromatographic behavior. However, the recovery data for three laboratories is between 29.3 and 182 percent for 20 of the 21 data points. The recoveries for the other three laboratories are greater than 200 percent. EPA does not have sufficient documentation to assess the problem that occurred at the three laboratories with high recovery values. EPA believes that this constituent can be analyzed at the levels of the proposed treatment standard, therefore, EPA plans on promulgating a concentration-based treatment standard for this constituent.

For dibenz(a,h)anthracene, the HWTC study had detection limits (3.0 to 20.6) above the proposed treatment standard and low recoveries. EPA

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RESPONSE:

believes sufficient data of unknown quality are available to set a concentration based standard for this constituent. The data from EPA's 14 incinerator test burns showed detection levels of 0.17 to 2.0 mg/kg Therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For dibenzo(a,e)pyrene, HWTC stated that there are no precision and accuracy data. In addition, EPA's Method Study 36 stated that there are analytical problems associated with this constituent. Therefore, EPA has chose to set a treatment method for this constituent in the final rule instead of a concentration-based nonwastewater treatment standard.

For dibenzo(a,i)pyrene, HWTC states that there is no SW-846 Method. EPA's Method Study 36 confirmed that SW-846 Method 8270 is not applicable for this constituent. Therefore, EPA has chosen to set a treatment method for the constituent in the final rule instead of a concentration-based nonwastewater treatment standard.

For 3,3'-dichlorobenzidine, 3,3'-dimethoxybenzidine, and 3,3'-dimethylbenzidine, HWTC stated that the constituents oxidize during sample preparation, have poor chromatography which generate erratic results, and thermally degrade upon injection. EPA agrees that there are analytical problems associated with analyzing these constituents in a nonwastewater matrix. Therefore, for 3,3'-dichlorobenzidine, EPA will promulgate a treatment method. For 3,3-dimethoxybenzidine and

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RESPONSE:

3,3'dimethylbenzidine, EPA proposed method of treatment as the standards, therefore, EPA will not revise the proposed nonwastewater standards for these two constituents.

For p-dimethylaminoazobenzene, EPA believes, based on the limited data available, that there may be some analytical problems associated with this constituent. Therefore, the Agency is promulgating a method of treatment for the nonwastewater treatment standard for this constituent.

For 4,6-dinitro-cresol and 2,4-dinitrophenol, HWTC stated that these constituents have erratic chromatagraphic behavior. HWTC's data for detection limits for these constituents can meet the proposed standards. EPA believes that these two constituents can be analyzed at the proposed levels, therefore, EPA plans on promulgating concentration-based nonwastewater treatment standards for these constituents.

For di-n-propylnitrosamine, the recovery values for the HWTC data are between 62.7 and 118.3 for two laboratories. For three laboratories, the recovery values are zero and for one the recovery data are between 2.5 and 40.7. There is insufficient documentation available to determine the sources of the poor recovery values for the four laboratories. Based on the data supplied for method detection limits, HWTC's detection limits are below the level set for the proposed standard. Therefore, EPA does not plan on revising the nonwastewater treatment standards for this constituent.

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RESPONSE:

For diphenylnitrosamine, HWTC listed the constituent on Table VI-2 which summarized constituents with analytical problems; however, there is no explanation of the specific problem presented in Table V-2. EPA believes that these constituents can be analyzed; however, since the constituent is not a U OR P waste code, and based on the limited data available, EPA has decided to promulgate a method of treatment as the nonwastewater treatment standard. EPA will promulgate a method of treatment as the nonwastewater treatment standard for this constituent.

For 1,2-diphenylhydrazine, HWTC stated that there is no method per SW-846. EPA proposed a method of treatment for this constituent for U109. Therefore, EPA does not plan on revising the proposed nonwastewater standard for this constituent.

For fluoranthene, the detection limits in HWTC's study ranged from 2.0 to 5.6 for four laboratories and were 17.7 and 37.7 for the remaining two laboratories. For EPA's 14 incineration test burns, the detection limit ranged from 0.15 to 2.0. Since most of the available data are below the proposed nonwastewater treatment standard, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For hexachlorocyclopentadiene, HWTC stated that the constituent is subject to thermal decomposition. EPA's Method Study 36 supports HWTC's statements concerning analytical problems associated with the

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RESPONSE:

constituent. Therefore, EPA has chosen to set a treatment method for this constituent for nonwastewaters in the final rule instead of a concentration-based nonwastewater treatment standard.

For hexachloropropene, the detection limits in HWTC's study were 0.02, 0.8, 40.7, and 70 for the four laboratories that submitted data. For EPA's 14 incineration test burns, the detection limits ranged from 0.33 to 10. EPA believes that this constituent can be analyzed at levels below the proposed treatment standard; therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For methapyrilene, isosafrole, phenacetin, and safrole, HWTC stated that the constituents have poor chromatography. The standards are based on the technology transfer from isosafrole, which has a poor distribution coefficient and is difficult to extract. Note HWTC's data for isosafrole showed recoveries between 36 and 100 percent for 41 of the 42 data points. EPA based the standard for isosafrole on the data obtained from the incineration of this constituent. These data are of adequate QA/QC. EPA believes that all four compounds can be analyzed at levels below the proposed nonwastewater treatment standards. The constituents are similar and the technology transfer of methyapyrilene, safrole, and phenacetin is appropriate. EPA does not plan on revising the proposed standards for these constituents based on the commenter's data.

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RESPONSE:

For 3-methylcholanthrene, HWTC stated that the constituent has low extraction efficiency. The detection limits from HWTC's study ranged from 4.7 to 22.5. The detection limits from EPA's 14 incineration test burns ranged from 0.23 to 5.0. The recovery data for this constituent was low but sufficient documentation are not available to determine the source of the problem. EPA believes that this constituent can be analyzed at levels below the proposed nonwastewater standard. Therefore, EPA plans on promulgating a concentration-based nonwastewater treatment standard for this constituent.

For naphthalene, the HWTC data for method detection limits ranged from 0.2 to 0.34 for five laboratories and was 5.7 for one laboratory. The detection limit data for EPA's 14 incineration test burns ranged from 0.11 to 1.0. Based on these data, EPA believes that naphthalene can be analyzed at levels below the proposed nonwastewater treatment standard. Therefore, EPA plans on promulgating a concentration-based nonwastewater treatment standard for this constituent.

For 1,4-naphthoquinone, HWTC did not comment on analytical problems concerning this constituent. However, based on the analytical concerns stated in EPA's Method Study 36, EPA has chosen to set a treatment method instead of a concentration-based nonwastewater treatment standard for this constituent.

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RESPONSE:

For 1-naphthylamine and 2-naphthylamine, HWTC stated that the constituents are highly polar and non-stable and have high adsorptive properties. EPA's Method Study 36 also stated that there are analytical problems associated with 1-naphthylamine. Based on a review of the data for both of these constituents, EPA believes that both analytes belong in the category of those not amenable to quantification. Therefore, a treatment method for nonwastewaters will be promulgated instead of a revised concentration-based nonwastewater treatment standard.

For nitrobenzene, the detection limits for the HWTC study ranged from 1.3 to 5 for five laboratories and 18.7 for one laboratory. In addition, the recovery values for 40 of the 42 data were between 38 and 150 percent. The detection limits for the 14 incineration test burns ranged from 0.13 to 5. Therefore, EPA believes that this constituent can be analyzed at the levels of the proposed nonwastewater treatment standards. As a result, EPA does not plan on revising its concentration-based nonwastewater treatment standard for this constituent.

For 4-nitrophenol, HWTC stated that this constituent has erratic chromatographic behavior. HWTC's recovery data show that for most (71 percent) of the samples the recovery values are between 24 and 124 percent. Documentation is insufficient to determine the problem at the three laboratories that had recovery problems with some of their values. Detection limit data indicate that the constituent can be analyzed at the level proposed for the nonwastewater treatment standard. Therefore, EPA

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RESPONSE:

will promulgate a concentration-based nonwastewater treatment standard for this constituent.

For n-nitrosodiethylamine, the HWTC study had detection limits of 8.3, 9.3, 30.6, 31.9, and 98.2. The detection limits for EPA's 14 incineration test burns ranged from 0.18 to 10. EPA believes that this constituent can be analyzed at levels proposed for the nonwastewater treatment standard. Therefore, EPA is not revising the concentration-based nonwastewater treatment standard for this constituent.

For n-nitrosodimethylamine, HWTC stated that this constituent coelutes with the solvent peak. EPA's Method Study 36 agreed with HWTC's comments concerning analytical problems. As a result, EPA will promulgate a method of treatment as a nonwastewater treatment standard for this constituent instead of a concentration-based nonwastewaters treatment standard.

For 5-nitro-o-toluidene, the detection limits for the HWTC study were 5.5, 10.9, 12.8, 26.4, 35.7, and 63.3. Recovery values ranged from 50-104 for most of the data. The detection limits for EPA's 14 incineration test burns ranged from 0.17 to 10. Therefore, EPA believes that this constituent can be analyzed at the level set for the proposed nonwastewater treatment standard. As a result, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

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RESPONSE:

For pentachloroethane, HWTC did not note any analytical problems, however, EPA's Method Study 36 did list it as a constituent with analytical problems. As a result, EPA will set a treatment method as the nonwastewater treatment standard for this constituent instead of a concentration-based nonwastewater treatment standard.

For pentachloronitrobenzene, HWTC stated that the constituent has poor chromatography. The detection limits reported in the HWTC study for this constituent are below the proposed nonwastewater treatment standard. The recovery data for three of the laboratories were between 46 and 106 percent for all but one sample. Sufficient documentation was not available to determine the problem at the third laboratory which had recoveries outside the 20 to 200 percent range. EPA believes that this constituent can be analyzed at the level for the proposed nonwastewater treatment standard. Therefore, EPA is not revising the proposed nonwastewater treatment standard for this constituent.

For pentachlorophenol, HWTC stated that the constituent has erratic chromatographic behavior. The detection limits for the HWTC data were below the proposed nonwastewater treatment standard and the recovery data for most of the samples were between 20 and 113 percent. EPA believes that this constituent can be analyzed at the levels set for the proposed treatment standard. Therefore, EPA will promulgate a concentration-based nonwastewater treatment standard for this constituent.

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RESPONSE:

For phenol, HWTC had high recoveries for most of the samples spiked. HWTC's detection limit data, however, are below the levels set for the proposed nonwastewater treatment standard. Therefore, EPA believes that this constituent can be analyzed at this level. As a result, EPA is not revising the proposed nonwastewater treatment standard for this constituent.

For phthalic anhydride, HWTC stated that the constituent should be deleted from study due to poor extraction. EPA's Method Study 36 also listed this constituent as having analytical problem. Therefore, for the multi-source nonwastewater, EPA will promulgate a method treatment for nonwastewaters instead of a concentration-based nonwastewater treatment standard.

For pronamide, HWTC data had detection limits that ranged from 0.25 to 0.81 for five laboratories and 9.8 for one laboratory. Therefore, only one laboratory has a detection limit above the proposed nonwastewater treatment standard. The proposed nonwastewater treatment standard is based on the incineration of pronamide; therefore, EPA does not plan on revising the proposed nonwastewater treatment standard for this constituent.

For pyrene, HWTC had high recoveries for most of the samples spiked. HWTC's detection limit data, however, are below the levels set for the proposed nonwastewater treatment standard. Therefore, EPA believes that

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RESPONSE:

this constituent can be analyzed at this level. EPA is promulgating a concentration based nonwastewater treatment standard for this constituent.

For resorcinol, HWTC stated that the constituent has poor chromatography. EPA's Method Study 36 also listed resorcinol as having analytical problems. Therefore, EPA will promulgate a method of treatment for nonwastewaters instead of a concentration-based nonwastewater treatment standard.

For 2,3,4,6-tetrachlorophenol, HWTC stated that the constituent is highly acidic and subject to absorptive loss during preparation and chromatography. HWTC's data does not fully support this statement since recovery data for 37 of the 42 data points are between 20 and 150 percent. EPA believes that this constituent can be analyzed at the level set for the proposed nonwastewater treatment standard; therefore, EPA is not revising the proposed treatment standard for this constituent.

For tris(2,3-dibromopropyl)phosphate, HWTC stated that the constituent has a poor detection response and that the laboratory is unable to chromatograph the constituent effectively. EPA agrees that there are analytical problems associated with this constituent; therefore, EPA is promulgating a method of treatment instead of a concentration-based nonwastewater treatment standard for this constituent.

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RESPONSE:

For bis(2-chloroethyl)ether (also known as dichloroethyl ether), HWTC stated that the constituent has analytical problems due to high water solubility. The recovery data for the HWTC study show that most of the values are between 20 and 150 percent. The detection limits for the HWTC data are below the level set for the nonwastewater treatment standard, therefore, EPA believes that this constituent can be analyzed at this level. EPA does not plan or revising the proposed nonwastewater treatment standard for this constituent.

Additional information on the treatment standards for the nonwastewater treatment standards promulgated for the U and P waste codes and the multi-source leachates can be found in the background document titled "Best Demonstrated Available Technology (BDAT) Background Document for U and P Wastes and Multisource Leachate (F039), Volumes B and C."

TABLE 1-DETECTION LIMITS FOR BDAT LIST CONSTITUENTS

Waste Code	BDAT #	Constituent	INCINERATOR ASH DETECTION LIMITS* (PPM) FOR 14 INCINERATION TEST BURNS 1	2	3	4	5	6	7	8	9	10	11	13	14	EDW DATA	HWTC DATA HWTC POOLED	HWTC LAB A	HWTC LAB B	HWTC LAB C	HWTC LAB D	HWTC LAB E	HWTC LAB F
U165	121	Naphthalene	0.11	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.36	0.33		1.000	5.730	0.200	0.3432	0.1054	0.313	0.176
U166	122	1,4-Naphthoquinone	5.00	0.08	0.10	2.00	5.00	4.00	0.200	NR	SNA	SNA	0.702	0.36	0.36								
U167	123	1-Naphthylamine	5.00	0.30	1.70	2.00	5.00	4.00	0.200	5.00	2.10	5.00	1.700	0.36	0.36		13.000	10.202		10.1001	0.9522	2.132	0.002
U168	124	2-Naphthylamine	5.00	0.07	1.70	2.00	5.00	4.00	0.200	5.00	2.10	5.00	1.700	0.36	0.36		10.000	12.561	20.010	0.9570	2.2140	2.432	
U169	126	Nitrobenzene	0.50	0.13	0.01	5.00	0.50	0.40	0.500	1.00	0.42	1.00	0.351	0.36	0.36		0.830	5.000	1.100	10.7474	1.3400	1.301	3.084
U170	127	4-Nitrophenol	2.50	0.10	0.05	10.00	2.50	2.00	1.000	5.00	2.00	5.00	1.700	1.70	1.70		20.300	65.142	11.714	20.2000	0.2502	0.708	0.060
U172	128	n-Nitrosodi-n-butylamine	5.00	0.21	0.70	5.00	5.00	4.00	0.500	NA	NA	NR	0.702	0.36	0.36		3.200	6.100	0.000	2.2035	0.4000	1.133	1.042
U174	129	n-Nitrosodiethylamine	5.00	0.10	0.35	10.00	5.00	4.00	1.000	NA	NA	NA	0.351	0.36	0.36		54.720	31.075	20.100	90.2270	0.3243	0.342	30.503
U179	133	n-Nitrosopiperidine	10.00	0.10	0.35	10.00	10.00	7.00	1.000	1.00	0.42	1.00	0.351	0.36	0.36		2.400	1.250	0.107	2.2001	0.3165	1.129	1.004
U180	134	n-Nitrosopyrrolidine	10.00	0.20	1.75	10.00	10.00	7.00	1.000	5.00	2.10	5.00	1.700	0.36	0.36		2.030	5.330	3.120	2.7000	1.0030	0.407	2.307
U181	135	5-Nitro-o-toluidine	10.00	0.17	0.70	NA	10.00	7.00	NA	2.00	0.84	2.00	0.702	0.36	0.36		34.000	20.355	5.841	35.0000	83.2001	10.077	12.034
U183	136	Pentachlorobenzene	0.50	0.10	0.01	10.000	0.50	0.40	1.000	NR	ND	ND	1.700	0.36	0.36		2.000	2.520	1.203	0.4000	0.7527	1.727	0.783
U184	137	Pentachloroethane	0.13	2.50	10.00	10.00	2.50	0.40	1.00	SNA	SNA	SNA	0.333	0.01	0.01		80.000	15.320	10.004	90.2040	0.0475	0.002	23.870
U185	138	Pentachloronitrobenzene	5.00	0.17	0.10	10.000	5.00	4.00	1.000	10.000	4.20	1.00	3.510	0.36	0.36		1.700	1.005	0.150		2.3575	0.132	
U187	140	Phenacetin	5.00	NA	0.70	2.00	5.00	4.00	0.200	2.00	0.84	2.00	0.702	0.36	0.36		20.710	2.074	0.455	0.7220	1.0022	0.325	10.070
U188	142	Phenol	0.50	0.10	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.36	0.36		4.400	1.200	0.710	4.4000	0.5701	1.030	1.014
U191	143	2-Picoline	5.00	0.10	0.35	20.00	5.00	4.00	2.000	1.00	0.42	1.00	0.351	0.36	0.36		10.200	4.020	11.510	10.5140	2.0443	0.036	0.225
U192	144	Pronamide	5.00	0.12	0.10	10.000	5.00	4.00	1.000	NR	ND	ND	0.702	0.36	0.36	1.330	3.100	0.007	0.020	0.0002	0.2475	0.045	0.274
U197	68	p-Benzoquinone	50.00	ND	ND	ND	50.00	40.00	ND	NR	ND	ND	0.351	NR	NR		84.020		0.441	43.0000		33.530	7.702
U201	146	Resorcinol	0.50	NR	NR	NR	0.50	400.00	NA	NR	NR	NR	0.351	NR	NR	3.330	100.020	125.034	230.325	90.0200		102.340	7.041
U203	147	Safrole	5.00	0.17	1.70	NA	5.00	4.00	NA	5.00	2.10	5.00	1.700	0.36	0.36		0.770	1.010	0.205	0.3701	0.2223	0.502	1.247
U207	148	1,2,4,5-Tetrachlorobenzene	5.00	0.10	0.01	5.00	5.00	0.40	0.500	2.00	0.84	2.00	0.702	0.36	0.36		0.200	0.400	0.244	0.2270	0.1567	0.156	0.074
U243	115	Hexachloropropene	0.30	2.50	10.00	10.00	2.50	0.40	1.00	SNA	SNA	SNA	0.666	0.36	0.33		101.320	0.021		70.0050	0.7565	48.725	

1 K001 - PCB Treatment Test
2 K001 - Creosote Treatment Test
3 K011, K013, K014 Treatment Test
4 K019 Treatment Test
5 K024 Treatment Test
6 K037 Treatment Test
7 K048, K051 Treatment Test
8 K087 Treatment Test
9 K101 Treatment Test
10 K102 Treatment Test
11 F024 Treatment Test
12 K015 Treatment Test
13 D014, D016, P050, U127, U182 Treatment Test
14 U141, U028, F020, U112, U226, U238, U080,
U220, U166, U161, U180 Treatment Test
NA - Not available.
ND - Not detected
NR - Not reported
SNA - Standard not available
* - Incinerator ash samples were not collected for test 12.

TABLE 1-DETECTION LIMITS FOR BDAT LIST CONSTITUENTS

Waste	BDAT		INCINERATOR ASH DETECTION LIMITS* (PPM) FOR 14 INCINERATION TEST BURNS														HWTC DATA						
Code	#	Constituent	1	2	3	4	5	6	7	8	9	10	11	13	14	CDW DATA	HWTC POOLED	HWTC LAB A	HWTC LAB B	HWTC LAB C	HWTC LAB D	HWTC LAB E	HWTC LAB F
SEMIVOLATILE ORGANICS																							
	131	N-Nitrosomethylethylamine	0.23	5.00	100.00	SNA	NR	4.00	SNA	1.00	0.42	1.00	0.333	0.30	0.33		2.000	2.171	2.310	4.0010	1.1000	0.550	1.070
P020	73	2-sec-Butyl-4,6-dinitrophenol	NA	NA	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30	1.330	62.740	17.903	10.032			30.920	14.024
P024	74	p-Chloroaniline	5.00	0.07	0.35	5.00	5.00	0.40	0.500	1.00	0.42	1.00	0.351	0.30	0.30		65.020	4.020	13.000	5.0037	7.1001	7.505	10.070
P027	76	3-Chloropropionitrile	NA	NA	0.70	NA	NA	NA	NA	NA	NA	NA	0.702	NA	NA		77.700	33.340	32.000			10.770	
P047	100	4,6-Dinitro-o-cresol and salts	2.50	1.00	0.05	50.000	2.50	2.00	5.000	5.00	2.00	5.00	1.700	1.70	1.70		37.270	25.004	30.000	74.4200	4.0707	25.000	0.309
P048	101	2,4-Dinitrophenol	2.50	2.00	0.05	50.000	2.50	2.00	5.000	5.00	2.00	5.00	1.700	1.70	1.70		27.000	64.010	1.705	10.1200	9.4003	13.770	1.220
P077	125	p-Nitroaniline	2.50	3.40	1.70	10.00	2.50	2.00	1.000	5.00	2.00	5.00	1.700	1.70	1.70		10.200	10.070	0.417	22.0474	5.2030	3.000	10.023
P082	130	n-Nitrosodimethylamine	5.00	0.07	0.30	20.00	5.00	4.00	2.000	1.00	0.42	1.00	0.351	0.30	0.30		4.730	1.200	3.340	5.2717		0.020	2.081
U004	93	Acetophenone	0.50	0.10	0.01	2.00	0.50	0.40	0.200	2.00	0.84	2.00	1.700	0.30	0.30		7.000	5.045	1.307	15.0350	0.0101	1.024	0.504
U005	94	2-Acetylaminofluorene	0.45	50.00	1000.00	SNA	50.00	40.00	SNA	2.00	0.84	2.00	0.666	0.30	0.33								
U007	233	Acrylamide	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR								
U012	96	Aniline	1.00	0.07	0.02	5.00	1.00	0.70	0.500	1.00	0.42	1.00	0.351	0.30	0.30		4.070	1.200	2.902	0.4002	0.0734	1.070	1.040
U018	59	Benz(a)anthracene	0.52	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.30	0.33		220.710	21.051	25.002	313.0000	124.6077	204.323	235.344
U021	61	Deleted (Benzidene)	NA	NA	NA	NA	NA	NA	NR	NA	NA	NA	NA	NA	NA		74.510	3.072		17.4730	2.7130		1.020
U022	62	Benzo(a)pyrene	0.17	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.30	0.33								
U024	67	Bis(2-chloroethoxy)methane	0.50	0.30	0.01	2.00	0.50	0.40	0.200	NA	0.42	1.00	0.351	0.40	0.50		4.300	2.034	0.400	0.0234	0.0700	0.302	1.504
U025	68	Bis(2-chloroethyl)ether	0.50	0.30	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		11.910	5.017	17.304	4.0504	0.0405		10.002
U027	69	Bis(2-chloroisopropyl)ether	0.50	0.30	0.35	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		4.270	1.043	0.720	4.2020	0.0304	1.345	4.000
U030	71	4-Bromophenyl phenyl ether	0.17	0.50	10.00	10.00	0.50	0.40	1.00	1.00	0.42	1.00	0.333	0.30	0.33		0.240	0.232	0.233	0.4002	0.0010	0.164	0.043
U038	75	Chlorobenzilate	NR	0.27	NR	NR	NR	NR	NA	NR	NR	NR	0.702	0.30	0.30		12.350	4.072	0.203	7.0035	2.0005	11.330	10.531
U039	76	p-Chloro-m-cresol	0.50	0.20	0.01	5.00	0.50	0.40	0.500	1.00	0.42	1.00	0.351	0.30	0.30		5.700	1.336	1.944	0.0750	0.2040	1.030	1.323
U047	77	2-Chloronaphthalene	0.50	0.13	0.35	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		1.000	1.100	0.550	1.1750	0.0135	0.416	
U048	78	2-Chlorophenol	0.50	0.22	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		0.110	0.250	0.003	0.1126	0.0430	0.047	0.061
U050	80	Chrysene	0.17	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.30	0.33		204.100	61.040	105.030	163.7670	100.5204	330.030	47.480
U052	81	o-Cresol	0.50	0.07	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		0.900	0.050	0.254	1.1401	0.2514	0.172	1.320
U052	82	p-Cresol	0.50	0.07	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		0.510	0.004	0.400	0.0032	0.4403	0.101	0.420
U057	232	Cyclohexanone	NA	NA	NA	NA	NA	NA	NR	NA	NA	NA	NA	0.40	0.40	3.000	21.570	10.314	15.020	14.0271	3.1002		0.110
U063	83	Dibenz(a,h)anthracene	0.17	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.30	0.33		22.100	2.070	0.027	20.6410	12.5000	12.020	0.260
U070	87	1,2-Dichlorobenzene	0.50	0.13	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		1.130	1.025	0.533	0.2044	0.4540	0.713	2.007
U071	86	1,3-Dichlorobenzene	0.50	0.13	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		0.800	1.357	0.301	0.2000	0.4100	0.205	0.312
U072	88	1,4-Dichlorobenzene	0.50	0.20	0.01	2.00	0.50	0.40	0.200	1.00	0.42	1.00	0.351	0.30	0.30		1.000	2.271	0.055	0.5120	0.0110	0.750	1.180
U073	89	3,3'-Dichlorobenzidine	1.00	1.10	0.02	10.000	1.00	0.70	1.000	2.00	0.84	2.00	1.760	0.71	0.72		125.340	31.021	122.070	20.4750		107.170	31.107
U074	234	cis-1,4-Dichloro-2-butene	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR								
U081	90	2,4-Dichlorophenol	0.50	0.18	0.01	5.00	0.50	0.40	0.500	1.00	0.42	1.00	0.351	0.30	0.30		0.120	0.201	0.003	0.3750	0.1220	0.043	0.043
U082	91	2,6-Dichlorophenol	0.50	0.40	0.01	5.00	0.50	0.40	0.500	NR	ND	ND	0.702	0.30	0.30								
U091	93	3,3'-Dimethoxybenzidine	500.00	NA	0.70	10.00	500.00	400.00	1.000	1.00	0.42	1.00	0.702	NA	NA		130.400			47.3200			112.073
U093	94	p-Dimethylaminoazobenzene	10.00	0.23	0.70	5.00	10.00	7.00	0.500	2.00	0.84	2.00	0.702	0.30	0.30		30.350	1.010	2.201	5.4207	1.3842	40.250	1.779
U095	95	3,3'-Dimethylbenzidine	500.00	0.55	0.70	NA	500.00	400.00	NA	NA	NA	NA	0.702	0.30	0.30								
U101	96	2,4-Dimethyl phenol	0.50	0.16	0.01	5.00	0.50	0.40	0.500	1.00	0.42	1.00	0.351	0.30	0.30		0.100	0.101	0.030	0.4110	0.1427	0.010	0.041
U105	102	2,4-Dinitrotoluene	0.50	0.30	0.35	50.00	0.50	0.40	5.000	1.00	0.42	1.00	0.351	0.30	0.30		11.000	13.324	0.023	10.4130	2.1527	7.002	2.022
U106	103	2,6-Dinitrotoluene	0.50	0.13	0.35	10.00	0.50	0.40	1.000	1.00	0.42	1.00	0.351	0.30	0.30		0.040	1.503	0.003	0.6712	0.4703	0.007	0.213
U111	105	Di-n-propylnitrosamine	NA	NA	0.30	5.00	NA	NA	0.500	NA	0.42	1.00	0.351	0.30	0.30		4.040	1.000	1.535	1.5734			
U120	108	Fluoranthene	0.15	0.50	10.00	2.00	0.50	0.40	0.20	1.00	0.42	1.00	0.333	0.30	0.33		13.470	5.012	5.000	17.0001	2.0042	2.204	37.711
U127	110	Hexachlorobenzene	0.50	0.13	0.01	10.000	0.50	0.40	1.000	1.00	0.42	1.00	0.351	0.30	0.30		0.200	0.450	0.255	0.3400	0.1097	0.190	0.005
U128	111	Hexachlorobutadiene	0.50	0.06	0.01	10.000	0.50	0.40	1.000	1.00	0.42	1.00	0.351	0.30	0.30		1.200	1.504	1.345	0.5000	0.4107	0.747	0.356
U130	112	Hexachlorocyclopentadiene	0.50	0.40	0.01	10.000	0.50	0.40	1.000	1.00	0.42	1.00	0.351	0.30	0.30		62.570			0.0200		40.700	3.017
U132	114	Hexachlorophene	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NR	NR		830.430				1024.5011		
U137	116	Indeno(1,2,3-cd)pyrene	0.25	0.50	10.00	5.00	0.50	0.40	0.50	1.00	0.42	2.00	0.333	0.30	0.33								
U141	117	Isosafrole	5.00	0.10	0.10	SNA	5.00	4.00	SNA	2.00	0.84	2.00	0.702	0.30	0.30	1.120	4.020		0.002	0.1007	0.1507	0.241	0.273
U155	118	Methapyrilene	NA	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.30	0.30		3.000	0.013	1.000	1.0700	0.0202	0.252	4.007
U157	119	3-Methylcholanthrene	0.23	5.00	100.00	SNA	5.00	4.00	SNA	2.00	0.84	1.00	0.666	0.30	0.33		15.010	14.751	17.400	22.4000		0.001	4.002
U158	120	4,4'-Methylenebis(2-chloroaniline)	10.00	NA	0.70	NA	10.00	7.00	NA	2.00	0.84	2.00	0.702	0.30	0.30		0.200	12.107	10.200	11.0400	0.5507		11.550

TABLE 1-DETECTION LIMITS FOR BDAT LIST CONSTITUENTS

Waste Code	BDAT #	Constituent	INCINERATOR ASH DETECTION LIMITS* (PPM) FOR 14 INCINERATION TEST BURNS 1	2	3	4	5	6	7	8	9	10	11	13	14	EDW DATA	HWTC DATA HWTC POOLED	HWTC LAB A	HWTC LAB B	HWTC LAB C	HWTC LAB D	HWTC LAB E	HWTC LAB F
VOLATILE ORGANICS																							
P003	2	Acrolein	50.00	500.00	0.10	100	NR	500	100	0.500	0.100	30.00	0.100	0.10	0.100		0.140	0.020		0.1895			
P101	30	Ethyl cyanide	0.10	NA	NA	100	NA	NA	100.00	0.500	0.100	30.00	0.100	NA	NA		7.700	7.244	12.303	4.1200	1.4079		0.173
U002	222	Acetone	50.00	50.00	0.05	10.000	50.00	50.00	10.00	0.050	0.010	3.00	0.010	0.01	0.020	0.200	2.210	1.705	3.059	0.0257	1.1377	3.010	4.007
U003	1	Acetonitrile	50.00	200.00	0.10	10.000	NA	200.00	10.00	0.500	0.100	30.00	0.100	0.20	0.200	0.210	4.100	0.050		0.2257	1.1320		
U009	3	Acrylonitrile	10.00	10.00	0.10	10.000	10.00	10.00	10.00	0.500	0.100	30.00	0.100	0.10	0.100	0.100	0.550	0.957	0.110	0.5408	1.4857	7.240	3.302
U019	4	Benzene	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.370	0.276	0.135	0.0389	0.0000	0.049	0.108
U031	273	n-Butyl alcohol	NA	NA	NA	NA	NR	NA	NA	NA	NA	NA	NA	0.40	0.400								
U029	6	Bromomethane	10.00	2.00	10.00	2.00	2.00	10.00	2.00	0.050	0.100	3.00	0.005	0.10	0.050	3.040	0.050	1.050	0.001	0.2302	0.1051	1.204	
U037	9	Chlorobenzene	2.00	10.00	5.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.01	0.010		0.250	0.105	0.047	0.0297	0.0043	0.300	0.442
U042	13	2-Chloroethyl vinyl ether	0.20	100.00	0.20	NA	NR	200.00	NA	0.050	0.010	3.00	0.010	NA	NA		0.540	0.704	0.442		0.4410		
U043	66	Vinyl chloride	2.00	10.00	0.01	2.00	2.00	10.00	2.00	0.050	0.010	3.00	0.010	0.02	0.010	0.200	0.800	1.130	0.250	0.2636	0.0589	0.063	
U044	14	Chloroform	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.450	0.572	0.020	0.0445	0.0017	0.534	0.478
U045	15	Chloromethane	2.00	10.00	0.01	2.00	2.00	10.00	2.00	0.050	0.010	3.00	0.010	0.02	0.020		0.800	0.773	0.053	0.2077			
U066	17	1,2-Dibromo-3-chloropropane	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.050	0.100	3.00	0.010	0.02	0.010		0.210	3.050	0.252	1.0500	0.0200		10.000
U067	18	1,2-Dibromoethane	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.400	0.300	0.115	0.0470	0.1330	0.089	0.254
U068	19	Dibromomethane	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.470	0.454	0.090	0.0020	0.1253	0.030	0.243
U074	20	trans-1,4-Dichloro-2-butene	10.00	0.25	50.00	10.00	SNA	500.00	20.00	0.050	0.100	30.00	0.100	0.02	0.010		1.700	0.647	0.740	0.0477			2.020
U075	21	Dichlorodifluoromethane	2.00	10.00	5.00	2.00	2.00	2.00	2.00	0.050	0.010	3.00	0.010	0.02	0.020		2.000	2.123	0.253	0.2081	0.3005	1.300	4.000
U076	22	1,1-Dichloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.500	1.245	0.002	0.1274	0.4200	2.003	0.304
U077	23	1,2-Dichloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.000	0.900	0.140	0.1521	0.1077	0.024	0.279
U078	24	1,1-Dichloroethylene	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.070	0.005	0.200	0.0020	0.0070	1.004	
U079	25	trans-1,2-Dichloroethene	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.740	1.023	0.170	0.0557	0.0044	0.570	
U080	26	Methylene chloride	50.00	50.00	50.00	2.00	200.00	500.00	10.00	0.025	0.005	1.50	0.005	0.10	0.050		1.040	2.003	0.212	0.0004	0.0040	0.464	0.510
U084	27	trans-1,3-Dichloropropene	10.00	25.00	5.00	5.00	25.00	50.00	5.00	0.025	0.005	1.50	0.005	0.10	0.050		0.410	0.360	0.130	0.0007	0.1120	0.020	0.107
U084	28	cis-1,3-Dichloropropene	10.00	25.00	5.00	10.00	25.00	50.00	5.00	0.025	0.005	1.50	0.005	0.10	0.050		0.300	0.410	0.107	0.0013	0.0050	0.521	0.010
U108	29	1,4-Dioxane	50.00	ND	ND	ND	100	ND	ND	1.000	0.200	60.00	0.200	0.40	0.400		3.500			0.0005	1.2176		
U112	226	Ethyl acetate	5.00	10.00	5.00	NA	2.00	2.00	NA	NA	NA	NA	NA	0.02	0.040	3.040	5.000	7.527	0.087	4.0184	1.7610		2.281
U117	227	Ethyl ether	50.00	ND	ND	NA	50.00	ND	NA	NA	NA	NA	NA	0.01	0.010	2.040	0.000	0.714	0.750	1.0044	1.1103	0.050	2.155
U118	31	Ethyl methacrylate	2.00	50.00	0.01	2.00	2.00	10.00	2.00	0.500	0.100	30.00	0.010	0.01	0.010		0.930	0.720	0.233	0.1702	0.2776	1.497	0.418
U121	48	Trichlorofluoromethane	2.00	10.00	5.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	2.00	2.000		1.000	1.021	0.108	0.0061	0.0527	2.992	
U138	32	Iodomethane	2.00	20.00	5.00	2.00	2.00	2.00	2.00	0.230	0.050	15.00	0.050	2.00	2.000		1.040	0.852	0.577	0.0750	0.0087	2.083	
U140	33	Isobutanol	0.20	ND	ND	2.00	NR	ND	2.00	1.000	0.200	60.00	0.200	1.00	1.000								
U152	37	Methacrylonitrile	0.20	NA	NA	10.00	10.00	NA	10.00	0.500	0.100	30.00	0.100	NA	10.000		0.700	4.103	0.701	4.0074	1.5715		3.835
U154	220	Methanol	NA	NA	ND	NA	NR	NA	NA	NA	NA	NA	NA	NR	NR								
U159	34	Methyl ethyl ketone	10.00	50.00	0.05	10.000	10.00	50.00	10.00	0.025	0.010	3.00	0.010	0.01	0.020		0.030	4.401	21.320	1.4260	3.2007	4.522	
U161	229	Methyl isobutyl ketone	10.00	100.00	0.01	10.000	10.00	10.00	10.00	0.025	0.010	3.00	0.010	0.01	0.020		1.710	1.072	1.270	0.2200	0.4104	3.255	1.104
U162	35	Methyl methacrylate	2.00	50.00	0.01	2.00	2.00	10.00	2.00	0.100	0.100	30.00	0.100	0.01	0.010		0.700	0.645	0.630	0.6330	0.2674	1.010	3.250
U171	230	2-Nitropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		2.000	0.950	3.207	0.0002			
U196	39	Pyridine	5.00	NA	NA	NA	5.00	NA	2.00	2.000	0.400	120.00	0.400	NA	0.500		4.400	1.811	5.124	0.5099		0.185	0.473
U208	40	1,1,1,2-Tetrachloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.050	0.430	0.106	0.1004	0.0004	1.401	0.673
U209	41	1,1,2,2-Tetrachloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050	3.420	0.300	0.420	0.027	0.0310	0.1410	0.050	0.410
U210	42	Tetrachloroethene	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.500	0.220	0.052	0.0278	0.1327	0.048	0.243
U211	7	Carbon tetrachloride	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050	2.200	0.070	0.488	0.238	0.1076	0.0703	0.477	0.204
U220	43	Toluene	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.440	0.520	0.257	0.1200	3.0710	0.023	0.095
U225	44	Tribromomethane	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.010	0.347	0.005	0.0029	0.1245	0.011	0.020
U226	45	1,1,1-Trichloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050	3.000	0.500	0.415	0.090	0.0030	0.1012	1.400	0.300
U227	46	1,1,2-Trichloroethane	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050			0.350	0.080	0.1403	0.1292	0.026	2.120
U228	47	Trichloroethene	10.00	10.00	2.00	2.00	10.00	20.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		0.720	0.354	0.535	0.0042	0.1725	0.770	0.360
U239	215	1,2-Xylene	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		1.000	0.157	1.014	0.0019	0.3702	0.435	1.264
U239	216	1,3 Xylene	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		1.000	0.157	1.014	0.0019	0.3702	0.435	1.264
U239	217	1,4-Xylene	10.00	2.00	2.00	2.00	2.00	2.00	2.00	0.025	0.005	1.50	0.005	0.10	0.050		1.000	0.157	1.014	0.0019	0.3702	0.435	1.264

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
U208	40	VLAB A	1,1,1,2-Tetrachloroethane	0.500	0.002	0.664	0.642	0.524	0.497	0.446	0.290	0.216	110.280	107.000	104.382	99.004	99.243	86.072	43.000	87.270	24.702	110.280	43.020
U208	40	VLAB B	1,1,1,2-Tetrachloroethane	0.500	0.000	0.348	0.249	0.334	0.330	0.323	0.320	0.318	69.600	99.200	66.000	88.000	84.000	84.000	63.000	99.250	2.206	99.000	63.000
U208	40	VLAB C	1,1,1,2-Tetrachloroethane	0.500		0.525	0.510	0.512	0.510	0.500	0.503	0.492	104.400	103.000	102.400	102.000	101.200	100.000	90.400	101.029	1.871	101.400	99.400
U208	40	VLAB D	1,1,1,2-Tetrachloroethane	0.500	0.190	0.623	0.670	0.565	0.561	0.540	0.530	0.475	90.552	83.721	82.122	91.641	78.486	78.343	88.041	90.544	9.037	99.552	88.041
U208	40	VLAB E	1,1,1,2-Tetrachloroethane	0.500		0.438	0.400	0.314	0.000	0.000	0.000	0.000	88.000	98.000	62.000	0.000	0.000	0.000	0.000	92.090	20.297	99.000	0.000
U208	40	VLAB F	1,1,1,2-Tetrachloroethane	0.500		0.679	0.660	0.703	0.750	0.752	0.743	0.452	175.000	100.000	102.000	151.000	150.400	149.000	60.400	147.000	24.700	175.000	60.400
U226	45	VLAB A	1,1,1-Trichloroethane	0.500		0.491	0.490	0.490	0.444	0.420	0.270	0.150	98.200	97.000	97.000	98.000	87.000	88.000	30.000	79.371	24.441	99.200	30.000
U226	45	VLAB B	1,1,1-Trichloroethane	0.500		0.418	0.410	0.390	0.300	0.200	0.300	0.252	83.600	83.000	79.000	76.000	72.000	72.000	79.400	79.057	8.130	83.000	79.400
U226	45	VLAB C	1,1,1-Trichloroethane	0.500		0.661	0.640	0.642	0.626	0.623	0.610	0.499	112.200	100.000	100.400	107.000	100.000	103.200	90.000	100.000	3.740	112.200	90.000
U226	45	VLAB D	1,1,1-Trichloroethane	0.500		0.659	0.660	0.697	0.656	0.654	0.643	0.602	130.400	130.000	137.400	131.000	120.000	120.000	150.000	132.229	8.061	130.400	120.000
U226	45	VLAB E	1,1,1-Trichloroethane	0.500		1.370	0.507	0.413	0.131	0.000	0.000	0.044	274.000	101.400	92.000	29.200	17.000	17.000	0.000	70.014	67.555	274.000	0.000
U226	45	VLAB F	1,1,1-Trichloroethane	0.500		0.679	0.743	0.673	0.656	0.560	0.562	0.501	175.000	148.000	134.000	131.000	117.000	112.400	100.200	131.049	23.300	175.000	100.200
U209	41	VLAB A	1,1,2,2-Tetrachloroethane	0.500	0.010	0.548	0.460	0.464	0.446	0.390	0.182	0.190	105.636	90.000	90.922	86.240	77.320	37.200	30.022	74.701	70.038	109.636	30.022
U209	41	VLAB B	1,1,2,2-Tetrachloroethane	0.500		0.238	0.241	0.229	0.190	0.172	0.171	0.114	81.260	48.200	45.000	30.000	34.400	34.200	22.000	38.049	9.222	81.200	22.000
U209	41	VLAB C	1,1,2,2-Tetrachloroethane	0.500		0.652	0.652	0.651	0.061	0.540	0.645	0.509	132.400	130.000	130.200	112.200	109.200	100.000	101.000	117.014	11.760	132.400	101.000
U209	41	VLAB D	1,1,2,2-Tetrachloroethane	0.500		0.234	0.232	0.227	0.200	0.104	0.170	0.155	46.000	48.400	48.400	41.000	38.000	34.000	31.000	40.671	6.703	46.000	31.000
U209	41	VLAB E	1,1,2,2-Tetrachloroethane	0.500		1.060	1.010	0.663	0.696	0.293	0.000	0.000	212.000	202.000	192.000	137.000	50.000	10.000	17.200	119.714	60.631	212.000	17.200
U209	41	VLAB F	1,1,2,2-Tetrachloroethane	0.500		0.611	0.700	0.704	0.674	0.550	0.641	0.156	182.200	141.000	140.000	124.000	110.000	100.200	31.200	118.400	30.652	182.200	31.200
U227	46	VLAB A	1,1,2-Trichloroethane	0.500	0.004	0.621	0.671	0.665	0.617	0.509	0.435	0.270	123.214	113.294	112.103	102.678	99.200	88.310	64.702	99.701	21.029	123.214	64.702
U227	46	VLAB B	1,1,2-Trichloroethane	0.500		0.492	0.451	0.442	0.439	0.400	0.391	0.300	99.000	99.200	85.400	87.000	81.200	79.000	78.000	88.000	6.066	99.600	78.000
U227	46	VLAB C	1,1,2-Trichloroethane	0.500		0.640	0.600	0.503	0.563	0.661	0.620	0.602	129.000	120.000	112.000	112.000	110.200	107.000	100.400	113.286	9.618	129.600	100.400
U227	46	VLAB D	1,1,2-Trichloroethane	0.500		0.496	0.485	0.403	0.498	0.410	0.411	0.299	90.000	97.000	99.000	89.000	83.000	82.200	79.000	90.371	7.012	99.000	79.000
U227	46	VLAB E	1,1,2-Trichloroethane	0.500		0.677	0.619	0.517	0.464	0.100	0.157	0.000	175.400	103.000	103.400	90.000	30.000	31.400	0.000	77.849	64.531	175.400	0.000
U227	46	VLAB F	1,1,2-Trichloroethane	0.500		3.474	3.400	3.102	3.033	2.630	2.702	1.400	694.000	681.000	620.400	606.000	587.600	540.400	293.000	572.171	124.000	694.000	293.000
	231	VLAB A	1,1,2-Trichlorotrifluoroethane	0.500	1.720	2.694	2.690	1.891	1.055	1.042	1.087	1.463	129.002	116.007	94.074	74.282	73.000	71.230	85.064	90.035	23.184	129.002	65.064
	231	VLAB B	1,1,2-Trichlorotrifluoroethane	0.500	0.027	0.714	0.707	0.690	0.670	0.657	0.686	0.550	88.036	49.644	48.303	47.882	46.041	42.387	39.103	46.161	3.720	59.035	39.103
	231	VLAB C	1,1,2-Trichlorotrifluoroethane	0.500		0.303	0.390	0.342	0.340	0.318	0.300	0.289	78.600	70.000	88.400	88.000	83.000	81.000	69.000	80.943	0.015	70.000	69.000
	231	VLAB D	1,1,2-Trichlorotrifluoroethane	0.500		0.350	0.340	0.337	0.330	0.302	0.297	0.291	70.000	99.000	67.400	67.200	80.400	89.400	60.200	84.000	4.097	70.000	60.200
	231	VLAB E	1,1,2-Trichlorotrifluoroethane	0.500		0.348	0.341	0.276	0.266	0.200	0.180	0.155	60.000	68.200	55.000	63.000	41.000	39.600	31.000	61.171	13.002	60.000	31.000
	231	VLAB F	1,1,2-Trichlorotrifluoroethane	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U076	22	VLAB A	1,1-Dichloroethane	0.500		1.234	1.142	0.902	0.056	0.660	0.402	0.110	246.800	228.400	180.400	171.000	112.000	82.400	23.000	190.743	73.331	246.800	23.000
U076	22	VLAB B	1,1-Dichloroethane	0.500		0.426	0.421	0.410	0.410	0.492	0.290	0.388	85.200	84.200	83.000	82.000	90.400	79.600	73.000	81.257	9.662	85.200	73.000
U076	22	VLAB C	1,1-Dichloroethane	0.500		0.484	0.410	0.406	0.406	0.392	0.273	0.250	96.000	83.000	81.200	81.000	78.400	74.000	71.000	81.000	7.483	99.000	71.000
U076	22	VLAB D	1,1-Dichloroethane	0.500		0.405	0.404	0.390	0.374	0.347	0.334	0.020	81.000	90.000	78.000	74.000	68.400	66.000	6.000	66.229	24.770	81.000	6.000
U076	22	VLAB E	1,1-Dichloroethane	0.500		0.506	0.432	0.251	0.200	0.170	0.110	0.002	101.000	86.400	80.200	40.000	35.200	23.200	16.400	80.429	29.647	101.000	16.400
U076	22	VLAB F	1,1-Dichloroethane	0.500		0.507	0.430	0.307	0.350	0.347	0.331	0.320	118.400	88.000	77.400	70.000	68.400	66.200	64.000	70.014	17.011	110.400	64.000
U078	24	VLAB A	1,1-Dichloroethylene	0.500	0.230	1.251	1.127	1.003	1.006	0.080	0.640	0.420	160.723	135.703	120.072	121.440	106.313	83.000	61.000	109.700	24.230	160.723	61.500
U078	24	VLAB B	1,1-Dichloroethylene	0.500		0.227	0.220	0.219	0.107	0.166	0.110	0.000	45.400	48.200	43.800	39.400	31.000	23.000	0.000	32.629	16.300	45.400	0.000
U078	24	VLAB C	1,1-Dichloroethylene	0.500		0.292	0.209	0.253	0.246	0.230	0.220	0.210	58.400	53.000	50.000	40.000	47.200	45.200	43.200	49.629	4.010	58.400	43.200
U078	24	VLAB D	1,1-Dichloroethylene	0.500		0.311	0.290	0.200	0.204	0.252	0.240	0.234	62.200	80.000	60.000	62.000	50.400	40.000	46.000	63.457	6.174	62.200	46.000
U078	24	VLAB E	1,1-Dichloroethylene	0.500		1.000	0.330	0.235	0.252	0.186	0.190	0.101	301.600	67.000	81.000	60.000	39.200	30.000	30.200	84.000	117.484	301.600	30.200
U078	24	VLAB F	1,1-Dichloroethylene	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	48	VLAB A	1,2,3-Trichloropropane	0.500	0.020	0.561	0.525	0.490	0.490	0.490	0.250	0.190	113.054	106.002	96.385	98.305	83.040	40.231	36.530	83.071	30.002	113.054	36.530
	48	VLAB B	1,2,3-Trichloropropane	0.500		0.670	0.588	0.563	0.554	0.402	0.391	0.300	114.000	113.000	113.000	110.000	90.400	70.200	77.200	90.257	17.074	114.000	77.200
	48	VLAB C	1,2,3-Trichloropropane	0.500		0.525	0.514	0.502	0.494	0.442	0.427	0.240	105.000	102.000	100.400	99.000	88.400	65.400	49.000	90.000	17.705	105.000	49.000
	48	VLAB D	1,2,3-Trichloropropane	0.500		0.422	0.403	0.403	0.383	0.391	0.282	0.350	84.400	80.000	80.000	79.000	78.200	72.400	71.000	70.000	4.210	84.400	71.000
	48	VLAB E	1,2,3-Trichloropropane	0.500		0.497	0.480	0.390	0.220	0.117	0.087	0.038	99.400	92.000	78.000	46.200	23.400	11.400	7.000	81.000	36.050	99.400	7.000
	48	VLAB F	1,2,3-Trichloropropane	0.500		1.036	0.831	0.861	0.704	0.786	0.755	0.476	207.000	166.200	172.200	162.000	151.200	161.000	95.000	169.429	32.087	207.000	95.000
U066	17	VLAB A	1,2-Dibromo-3-chloropropane	5.000	0.430	5.810	5.299	5.071	4.725	4.044	3.166	2.374	100.600	97.400	93.200	98.021	85.430	88.223	43.072	81.000	30.080	100.600	43.072
U066	17	VLAB B	1,2-Dibromo-3-chloropropane	5.000		6.250	6.170	6.089	6.909	3.037	2.664	2.946	120.120	123.600	121.700	118.100	80.740	97.680	68.000	96.429	30.042	125.120	68.000
U066	17	VLAB C	1,2-Dibromo-3-chloropropane	5.000		5.501	5.390	6.326	6.155	4.400	4.450	3.074	110.020	107.000	106.520	103.100	89.300	89.000	70.400	87.000	10.037	110.020	79.480
U066	17	VLAB D	1,2-Dibromo-3-chloropropane	5.000		2.090	2.070	2.040	1.980	1.920	1.810	1.770	53.000	41.400	40.800	39.200	38.400	36.200	36.000	41.029	6.610	53.000	36.400
U066	17	VLAB E	1,2-Dibromo-3-chloropropane	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U066	17	VLAB F	1,2-Dibromo-3-chloropropane	5.000		15.120	13.445	12.019	12.703	12.000	11.000	0.000	302.000	268.000	250.200	254.000	282.000	233.300	0.000	224.100	93.000	302.000	0.000
U067	18	VLAB A	1,2-Dibromoethane	0.500	0.006	0.556	0.547	0.529	0.510	0.501	0.331	0.256	100.690	109.103	104.546	100.781	90.012	85.416	90.000	91.070	21.300	109.690	60.000
U067	18	VLAB B	1,2-Dibromoethane	0.500		0.403	0.399	0.300	0.307	0.336	0.324	0.323	80.600	78.000	77.800	77.400	67.000	64.000	64.000	73.143	8.702	80.600	64.000

TABLE 9 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
U067	10	VLAB C	1,2-Dibromoethane	0.500		0.462	0.461	0.460	0.440	0.432	0.431	0.429	92.400	92.200	92.000	88.000	86.400	86.200	85.800	89.257	2.924	92.400	85.800
U067	10	VLAB D	1,2-Dibromoethane	0.500		0.481	0.471	0.465	0.436	0.434	0.385	0.365	96.200	94.200	93.000	87.200	86.800	77.000	73.000	86.714	7.980	96.200	73.000
U067	10	VLAB E	1,2-Dibromoethane	0.500		0.507	0.472	0.420	0.113	0.081	0.063	0.000	101.400	94.400	84.000	22.600	16.200	12.600	0.000	47.314	40.377	101.400	0.000
U067	10	VLAB F	1,2-Dibromoethane	0.500		0.900	0.895	0.876	0.817	0.813	0.786	0.762	180.000	179.000	175.200	163.400	162.600	157.200	152.400	166.171	10.940	180.000	152.400
U077	23	VLAB A	1,2-Dichloroethane	0.500		0.650	0.633	0.616	0.558	0.546	0.279	0.207	130.000	126.600	123.200	111.600	109.200	55.800	41.400	99.686	33.258	130.000	41.400
U077	23	VLAB B	1,2-Dichloroethane	0.500		0.530	0.526	0.524	0.507	0.441	0.436	0.429	106.000	105.200	104.800	101.400	88.200	87.200	85.800	96.943	8.716	106.000	85.800
U077	23	VLAB C	1,2-Dichloroethane	0.500		0.601	0.584	0.577	0.544	0.523	0.490	0.469	120.200	116.800	115.400	108.800	104.600	98.000	93.800	108.229	8.998	120.200	93.800
U077	23	VLAB D	1,2-Dichloroethane	0.500		0.500	0.490	0.486	0.472	0.466	0.420	0.415	100.000	98.000	97.200	94.400	93.200	84.000	83.000	92.829	6.348	100.000	83.000
U077	23	VLAB E	1,2-Dichloroethane	0.500		0.903	0.595	0.405	0.103	0.154	0.150	0.085	180.600	119.000	81.000	20.600	30.800	30.000	17.000	72.014	64.416	180.600	17.000
U077	23	VLAB F	1,2-Dichloroethane	0.500		1.144	1.025	1.020	0.984	0.980	0.885	0.883	228.800	205.000	204.000	196.800	196.000	177.000	176.600	197.743	18.468	228.800	176.600
	26	VLAB A	1,2-Dichloropropane	0.500	0.002	0.644	0.633	0.603	0.477	0.466	0.384	0.353	128.267	126.600	120.120	95.030	92.820	76.518	69.306	97.010	27.208	128.267	69.306
	26	VLAB B	1,2-Dichloropropane	0.500		0.434	0.409	0.391	0.367	0.366	0.362	0.359	86.800	81.800	78.200	73.400	73.200	72.400	71.800	76.800	5.288	86.800	71.800
	26	VLAB C	1,2-Dichloropropane	0.500		0.736	0.686	0.675	0.664	0.572	0.529	0.515	147.200	137.200	135.000	132.800	114.400	105.800	103.000	125.057	16.888	147.200	103.000
	26	VLAB D	1,2-Dichloropropane	0.500		0.438	0.430	0.426	0.417	0.409	0.402	0.379	87.600	86.000	85.200	83.400	81.800	80.400	75.800	82.886	3.844	87.600	75.800
	26	VLAB E	1,2-Dichloropropane	0.500		0.561	0.349	0.343	0.317	0.225	0.213	0.121	112.200	69.800	68.600	63.400	45.000	42.600	24.200	60.829	26.942	112.200	24.200
	26	VLAB F	1,2-Dichloropropane	0.500		0.900	0.845	0.813	0.793	0.786	0.740	0.706	180.000	169.000	162.600	158.600	157.200	148.000	141.200	159.514	11.780	180.000	141.200
	10	VLAB A	2-Chloro-1,3-Butadiene	1.000		1.124	1.086	0.951	0.904	0.811	0.526	0.474	112.400	108.600	95.100	90.400	81.100	52.600	47.400	83.943	24.000	112.400	47.400
	10	VLAB B	2-Chloro-1,3-Butadiene	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	10	VLAB C	2-Chloro-1,3-Butadiene	5.000		6.216	3.575	2.320	1.504	1.267	0.968	0.886	124.320	71.500	46.400	30.080	25.340	19.360	17.720	47.817	38.000	124.320	17.720
	10	VLAB D	2-Chloro-1,3-Butadiene	5.000		1.350	1.150	1.130	1.020	0.781	0.606	0.217	27.000	23.000	22.600	20.400	15.620	12.120	4.340	17.869	7.174	27.000	4.340
	10	VLAB E	2-Chloro-1,3-Butadiene	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	10	VLAB F	2-Chloro-1,3-Butadiene	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U042	13	VLAB A	2-Chloroethyl vinyl ether	1.000	0.013	0.968	0.853	0.743	0.590	0.481	0.479	0.272	95.558	84.206	73.340	58.201	47.403	47.205	25.851	61.438	22.218	95.558	25.851
U042	13	VLAB B	2-Chloroethyl vinyl ether	1.000		0.556	0.537	0.474	0.453	0.368	0.222	0.215	55.600	53.700	47.400	45.300	36.800	22.200	21.500	40.357	13.009	55.600	21.500
U042	13	VLAB C	2-Chloroethyl vinyl ether	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U042	13	VLAB D	2-Chloroethyl vinyl ether	1.000		0.952	0.849	0.832	0.810	0.741	0.657	0.466	95.200	84.900	83.200	81.000	74.100	65.700	46.600	75.814	13.612	95.200	46.600
U042	13	VLAB E	2-Chloroethyl vinyl ether	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U042	13	VLAB F	2-Chloroethyl vinyl ether	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U171	230	VLAB A	2-Nitropropane	1.000	0.003	1.400	1.250	1.246	1.040	0.918	0.733	0.580	139.322	114.913	113.000	95.074	83.257	67.893	57.800	98.075	26.004	139.322	57.800
U171	230	VLAB B	2-Nitropropane	1.000		3.430	2.847	2.330	2.270	0.883	0.667	0.663	343.000	284.700	233.000	227.000	88.300	66.700	66.300	186.729	94.455	343.000	66.300
U171	230	VLAB C	2-Nitropropane	1.000		0.619	0.557	0.500	0.456	0.214	0.129	0.068	61.900	55.700	50.000	45.600	21.400	12.900	6.800	36.329	20.347	61.900	6.800
U171	230	VLAB D	2-Nitropropane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U171	230	VLAB E	2-Nitropropane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U171	230	VLAB F	2-Nitropropane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	16	VLAB A	3-Chloro-1-propene	0.500		0.884	0.633	0.489	0.446	0.148	0.000	0.000	176.800	126.600	97.800	89.200	29.600	0.000	0.000	74.343	62.000	176.800	0.000
	16	VLAB B	3-Chloro-1-propene	0.500		0.235	0.160	0.131	0.128	0.098	0.072	0.029	47.000	32.000	26.200	25.600	19.600	14.400	5.800	24.371	12.208	47.000	5.800
	16	VLAB C	3-Chloro-1-propene	0.500		0.398	0.393	0.356	0.334	0.290	0.257	0.178	79.600	78.600	71.200	66.800	58.000	51.400	35.600	63.029	15.051	79.600	35.600
	16	VLAB D	3-Chloro-1-propene	0.500		0.407	0.393	0.379	0.363	0.361	0.323	0.316	81.400	78.600	75.800	72.600	72.200	64.600	63.200	72.629	6.201	81.400	63.200
	16	VLAB E	3-Chloro-1-propene	0.500		2.200	1.470	0.715	0.460	0.231	0.129	0.051	440.000	294.000	143.000	92.000	46.200	25.800	10.200	150.143	149.348	440.000	10.200
	16	VLAB F	3-Chloro-1-propene	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U002	222	VLAB A	Acetone	1.000	0.050	1.597	1.530	1.494	1.097	0.931	0.382	0.107	151.747	146.931	141.070	103.588	87.913	37.016	17.658	97.960	49.022	151.747	17.658
U002	222	VLAB B	Acetone	1.000	0.182	3.311	2.749	1.278	1.273	1.078	0.329	0.209	264.940	235.000	100.963	100.592	92.771	28.095	25.731	120.000	81.490	264.940	25.731
U002	222	VLAB C	Acetone	1.000	3.107	2.497	2.497	2.341	2.335	2.317	2.201	1.719	80.495	80.495	65.770	66.036	65.206	62.442	40.934	64.141	8.804	80.495	40.934
U002	222	VLAB D	Acetone	1.000	1.100	2.482	2.226	2.111	1.848	1.774	1.640	1.510	118.667	100.000	100.824	87.906	84.470	73.619	72.109	91.012	16.081	118.667	72.109
U002	222	VLAB E	Acetone	1.000		3.520	2.210	1.510	1.470	0.820	0.029	0.000	352.000	221.000	151.000	147.000	82.000	2.900	0.000	136.557	115.442	352.000	0.000
U002	222	VLAB F	Acetone	1.000	3.750	3.426	3.063	0.000	0.000	0.000	0.000	0.000	72.120	64.484	0.000	0.000	0.000	0.000	0.000	19.515	30.929	72.120	0.000
U003	1	VLAB A	Acetonitrile	5.000		4.554	2.595	0.027	0.000	0.000	0.000	0.000	91.080	51.900	0.540	0.000	0.000	0.000	0.000	20.503	33.905	91.080	0.000
U003	1	VLAB B	Acetonitrile	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U003	1	VLAB C	Acetonitrile	5.000		6.695	6.176	2.820	2.482	2.377	2.140	2.135	133.900	123.520	56.400	49.640	47.540	42.800	42.700	70.929	38.000	133.900	42.700
U003	1	VLAB D	Acetonitrile	5.000		3.940	3.700	3.660	3.520	3.140	3.080	3.000	78.800	74.000	73.200	70.400	62.800	61.600	60.000	68.714	6.664	78.800	60.000
U003	1	VLAB E	Acetonitrile	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U003	1	VLAB F	Acetonitrile	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P003	2	VLAB A	Acrolein	5.000		0.025	0.014	0.010	0.007	0.000	0.000	0.000	0.500	0.280	0.200	0.140	0.000	0.000	0.000	0.160	0.173	0.500	0.000
P003	2	VLAB B	Acrolein	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P003	2	VLAB C	Acrolein	5.000		0.207	0.106	0.099	0.072	0.070	0.070	0.060	4.140	2.120	1.980	1.440	1.400	1.400	1.200	1.954	0.946	4.140	1.200
P003	2	VLAB D	Acrolein	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
P003	2	VLAB E	Acrolein	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P003	2	VLAB F	Acrolein	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U009	3	VLAB A	Acrylonitrile	5.000		9.220	8.535	6.596	5.833	5.522	4.470	3.656	184.400	170.700	131.920	118.000	110.440	89.400	73.120	125.426	41.905	184.400	73.120
U009	3	VLAB B	Acrylonitrile	5.000		6.561	6.115	3.782	4.901	2.703	2.692	1.095	131.220	122.300	75.640	98.020	54.000	53.840	21.900	74.300	36.832	131.220	21.900
U009	3	VLAB C	Acrylonitrile	5.000		1.994	1.939	1.718	1.716	1.500	1.900	1.451	38.000	38.780	34.360	34.320	30.000	38.000	29.020	33.364	3.180	38.780	29.020
U009	3	VLAB D	Acrylonitrile	5.000		4.110	4.560	4.400	4.020	3.950	3.600	3.410	82.200	91.200	88.000	80.400	79.000	72.000	68.200	81.057	8.641	91.200	68.200
U009	3	VLAB E	Acrylonitrile	5.000		6.070	5.010	2.160	1.540	0.946	0.335	0.137	121.400	100.200	43.200	30.800	18.920	6.700	2.740	46.280	43.291	121.400	2.740
U009	3	VLAB F	Acrylonitrile	5.000		7.240	6.742	6.395	5.401	5.470	4.800	4.475	144.820	134.840	127.900	108.020	109.400	96.000	89.500	114.000	19.453	144.820	89.500
U019	4	VLAB A	Benzene	0.500		0.625	0.620	0.539	0.531	0.522	0.450	0.360	125.000	124.000	107.800	106.200	104.400	90.000	72.000	105.543	19.271	125.000	72.000
U019	4	VLAB B	Benzene	0.500	0.090	0.529	0.617	0.516	0.515	0.463	0.439	0.430	98.900	99.891	99.723	99.886	76.134	73.782	72.200	81.000	8.657	98.900	72.200
U019	4	VLAB C	Benzene	0.500		0.491	0.479	0.475	0.465	0.465	0.450	0.400	98.200	95.800	95.000	93.000	93.000	90.000	80.000	93.400	2.300	98.200	80.000
U019	4	VLAB D	Benzene	0.500	0.218	0.544	0.537	0.526	0.515	0.513	0.482	0.476	75.766	74.852	73.259	71.727	71.448	67.131	66.320	71.329	3.553	75.766	66.320
U019	4	VLAB E	Benzene	0.500		0.561	0.465	0.390	0.146	0.127	0.120	0.000	112.200	93.000	78.000	29.200	25.400	24.000	0.000	51.686	37.700	112.200	0.000
U019	4	VLAB F	Benzene	0.500	0.186	0.809	0.790	0.790	0.753	0.716	0.696	0.646	117.950	115.320	115.102	109.027	104.520	101.400	94.207	106.394	8.013	117.950	94.207
	5	VLAB A	Bromodichloromethane	0.500		0.546	0.510	0.489	0.416	0.414	0.420	0.203	109.200	102.000	97.800	83.200	82.800	84.000	40.600	81.400	23.665	109.200	40.600
	5	VLAB B	Bromodichloromethane	0.500		0.349	0.348	0.344	0.344	0.341	0.330	0.331	69.800	69.600	68.800	68.800	68.200	66.000	66.200	68.286	1.299	69.800	66.200
	5	VLAB C	Bromodichloromethane	0.500		0.607	0.590	0.585	0.581	0.590	0.561	0.553	121.400	118.000	117.000	116.200	118.000	112.200	110.600	116.029	3.410	121.400	110.600
	5	VLAB D	Bromodichloromethane	0.500		0.443	0.431	0.424	0.405	0.450	0.381	0.372	88.600	86.200	84.800	81.000	90.000	76.200	74.400	81.000	4.864	88.600	74.400
	5	VLAB E	Bromodichloromethane	0.500		0.513	0.442	0.432	0.215	0.215	0.165	0.114	102.600	88.400	86.400	43.000	43.000	33.000	22.800	60.314	29.237	102.600	22.800
	5	VLAB F	Bromodichloromethane	0.500		0.875	0.852	0.833	0.832	0.822	0.820	0.755	175.000	170.400	166.600	166.400	164.400	164.000	151.000	165.014	7.029	175.000	151.000
U029	6	VLAB A	Bromomethane	1.000		1.260	1.182	1.103	1.094	0.914	0.931	0.383	126.000	118.200	110.300	109.400	91.400	93.100	38.300	98.100	31.205	126.000	38.300
U029	6	VLAB B	Bromomethane	1.000		0.840	0.850	0.844	0.424	0.418	0.401	0.342	84.000	85.000	84.400	42.400	41.800	40.100	34.200	58.843	18.526	85.000	34.200
U029	6	VLAB C	Bromomethane	1.000		0.600	0.550	0.535	0.512	0.424	0.424	0.417	60.000	55.000	53.500	51.200	42.400	42.400	41.700	49.457	7.068	60.000	41.700
U029	6	VLAB D	Bromomethane	1.000		0.161	0.108	0.085	0.079	0.070	0.094	0.081	16.100	10.800	8.500	7.900	7.000	9.400	8.100	9.686	3.098	16.100	8.100
U029	6	VLAB E	Bromomethane	1.000		1.100	0.707	0.880	0.340	0.267	0.232	0.081	110.000	70.700	88.000	34.000	26.700	23.200	8.100	51.529	35.487	110.000	8.100
U029	6	VLAB F	Bromomethane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8	VLAB A	Carbon disulfide	0.500	0.133	0.722	0.719	0.699	0.675	0.570	0.611	0.429	114.060	113.590	110.427	106.635	90.047	98.727	67.773	97.000	16.920	114.060	67.773
	8	VLAB B	Carbon disulfide	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8	VLAB C	Carbon disulfide	0.500		0.209	0.206	0.200	0.192	0.194	0.184	0.183	41.800	41.200	40.000	38.400	38.800	36.800	36.600	39.220	1.850	41.800	36.600
	8	VLAB D	Carbon disulfide	0.500		0.163	0.156	0.144	0.143	0.131	0.127	0.124	32.600	31.200	28.800	28.600	26.200	25.400	24.800	28.229	2.733	32.600	24.800
	8	VLAB E	Carbon disulfide	0.500		0.349	0.285	0.212	0.112	0.062	0.042	0.000	69.800	57.000	42.400	22.400	12.400	8.400	0.000	30.343	24.449	69.800	0.000
	8	VLAB F	Carbon disulfide	0.500		0.522	0.000	0.000	0.000	0.000	0.000	0.000	104.400	0.000	0.000	0.000	0.000	0.000	0.000	14.914	36.527	104.400	0.000
U211	7	VLAB A	Carbon tetrachloride	0.500	0.001	0.496	0.486	0.451	0.401	0.366	0.153	0.115	93.814	91.817	90.020	80.040	71.050	30.538	22.854	68.433	27.390	93.814	22.854
U211	7	VLAB B	Carbon tetrachloride	0.500		0.294	0.260	0.255	0.210	0.190	0.166	0.066	58.800	52.000	51.000	42.000	38.000	33.200	13.200	41.171	14.074	58.800	13.200
U211	7	VLAB C	Carbon tetrachloride	0.500		0.616	0.600	0.552	0.586	0.585	0.559	0.512	123.200	120.000	110.400	117.200	117.000	111.800	102.400	114.571	6.306	123.200	102.400
U211	7	VLAB D	Carbon tetrachloride	0.500		0.390	0.384	0.379	0.371	0.370	0.349	0.323	78.000	76.800	75.800	74.200	74.000	69.800	64.600	72.043	4.486	78.000	64.600
U211	7	VLAB E	Carbon tetrachloride	0.500		0.393	0.247	0.159	0.066	0.000	0.000	0.000	78.600	49.400	31.800	13.200	0.000	0.000	0.000	24.714	29.182	78.600	0.000
U211	7	VLAB F	Carbon tetrachloride	0.500		1.415	1.385	1.311	1.285	1.275	1.260	1.243	283.000	277.000	262.200	257.000	255.000	252.000	248.600	262.229	12.623	283.000	248.600
U037	9	VLAB A	Chlorobenzene	0.500	0.326	0.499	0.479	0.450	0.449	0.418	0.400	0.343	60.485	58.001	54.545	54.424	50.605	48.485	41.570	52.088	6.071	60.485	41.570
U037	9	VLAB B	Chlorobenzene	0.500	0.020	0.219	0.207	0.202	0.202	0.199	0.179	0.179	42.115	39.815	38.884	38.830	38.340	34.423	34.423	37.446	2.029	42.115	34.423
U037	9	VLAB C	Chlorobenzene	0.500	0.293	0.306	0.309	0.309	0.304	0.297	0.294	0.288	38.590	38.966	38.980	38.330	37.453	37.074	36.318	38.047	1.063	38.980	36.318
U037	9	VLAB D	Chlorobenzene	0.500	0.129	0.361	0.337	0.329	0.326	0.320	0.312	0.296	57.484	53.582	52.305	51.911	50.837	49.602	47.134	51.043	3.018	57.484	47.134
U037	9	VLAB E	Chlorobenzene	0.500		0.277	0.259	0.125	0.065	0.061	0.000	0.000	55.400	51.800	25.000	13.000	12.200	0.000	0.000	22.571	21.106	55.400	0.000
U037	9	VLAB F	Chlorobenzene	0.500	0.118	0.412	0.387	0.358	0.357	0.337	0.311	0.000	66.721	62.620	57.997	57.836	54.443	50.242	0.000	49.980	20.931	66.721	0.000
	12	VLAB A	Chloroethane	1.000		1.005	1.401	1.344	1.320	1.240	0.961	0.400	100.500	140.100	134.400	132.000	124.000	96.100	40.000	110.171	30.088	140.100	40.000
	12	VLAB B	Chloroethane	1.000		0.635	0.441	0.413	0.074	0.050	0.032	0.000	63.500	44.100	41.300	7.400	5.000	3.200	0.000	23.500	23.025	63.500	0.000
	12	VLAB C	Chloroethane	1.000		0.715	0.593	0.557	0.521	0.470	0.458	0.437	71.500	59.300	55.700	52.100	47.000	45.800	43.700	53.714	8.971	71.500	43.700
	12	VLAB D	Chloroethane	1.000		0.267	0.240	0.232	0.205	0.171	0.158	0.165	26.700	24.000	23.200	20.500	17.100	15.800	16.500	20.543	3.832	26.700	15.800
	12	VLAB E	Chloroethane	1.000		0.772	0.711	0.253	0.180	0.179	0.174	0.114	77.200	71.100	25.300	18.000	17.900	17.400	11.400	34.129	25.837	77.200	11.400
	12	VLAB F	Chloroethane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U044	14	VLAB A	Chloroform	0.500		0.635	0.597	0.585	0.520	0.505	0.227	0.185	127.000	119.400	117.000	104.000	101.000	45.400	37.000	93.143	33.759	127.000	37.000
U044	14	VLAB B	Chloroform	0.500	0.000	0.462	0.454	0.450	0.448	0.440	0.440	0.437	92.400	90.800	90.000	89.600	88.000	88.000	87.400	89.457	1.659	92.400	87.400
U044	14	VLAB C	Chloroform	0.500		0.551	0.550	0.548	0.542	0.540	0.523	0.514	110.200	110.000	109.600	108.400	108.000	104.600	102.800	107.657	2.856	110.200	102.800
U044	14	VLAB D	Chloroform	0.500		0.455	0.443	0.441	0.440	0.430	0.406	0.380	91.000	88.600	88.200	88.000	86.000	81.200	76.000	85.571	4.816	91.000	76.000
U044	14	VLAB E	Chloroform	0.500		0.544	0.519	0.512	0.360	0.231	0.175	0.155	100.000	103.000	102.400	72.000	46.200	35.000	31.000	71.429	31.462	103.000	31.000
U044	14	VLAB F	Chloroform	0.500	0.170	1.064	0.966	0.827	0.751	0.722	0.672	0.670	158.806	144.179	123.433	112.090	107.761	100.299	100.000	120.938	21.833	158.806	100.000

TABLE 2-SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
U045	15	VLAB A	Chloromethane	1.000		1.290	1.115	1.100	1.025	0.840	0.730	0.681	129.000	111.500	110.000	102.500	84.000	73.000	68.100	96.843	22.773	129.000	68.100
U045	15	VLAB B	Chloromethane	1.000		1.170	1.174	1.093	1.032	0.783	0.760	0.686	117.000	117.400	109.300	103.200	78.300	76.000	68.600	95.686	19.220	117.600	68.600
U045	15	VLAB C	Chloromethane	1.000	0.716	0.354	0.322	0.290	0.273	0.234	0.206	0.163	20.841	18.770	18.327	15.918	13.644	11.983	9.604	15.252	3.677	20.841	9.504
U045	15	VLAB D	Chloromethane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U045	15	VLAB E	Chloromethane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U045	15	VLAB F	Chloromethane	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U084	28	VLAB A	cis-1,3-Dichloropropene	0.500		0.562	0.537	0.491	0.381	0.356	0.315	0.200	112.400	107.400	98.200	76.200	71.200	63.000	40.000	81.200	24.145	112.400	40.000
U084	28	VLAB B	cis-1,3-Dichloropropene	1.000	0.000	0.601	0.586	0.557	0.510	0.509	0.477	0.430	60.100	58.600	55.700	51.000	50.900	47.700	43.000	52.314	6.405	60.100	43.000
U084	28	VLAB C	cis-1,3-Dichloropropene	0.500		0.534	0.531	0.526	0.515	0.506	0.483	0.465	106.800	106.200	105.200	103.000	101.600	96.600	93.000	101.771	4.809	106.800	93.000
U084	28	VLAB D	cis-1,3-Dichloropropene	0.500		0.431	0.418	0.415	0.400	0.398	0.365	0.355	86.200	83.600	83.000	80.000	79.600	73.000	71.000	79.486	5.010	86.200	71.000
U084	28	VLAB E	cis-1,3-Dichloropropene	0.500		0.497	0.423	0.231	0.160	0.116	0.107	0.076	99.400	84.600	46.200	32.000	23.200	21.400	15.200	46.057	30.703	99.400	15.200
U084	28	VLAB F	cis-1,3-Dichloropropene	0.500		0.729	0.721	0.694	0.680	0.641	0.623	0.000	145.800	144.200	138.800	136.000	128.200	124.600	0.000	116.486	48.079	145.800	0.000
		VLAB A	Cumene	0.500	0.010	0.425	0.420	0.407	0.400	0.390	0.382	0.363	83.333	82.353	79.804	78.431	76.471	74.902	71.176	78.067	3.951	83.333	71.176
		VLAB B	Cumene	0.500		0.333	0.325	0.322	0.305	0.288	0.282	0.282	66.600	65.000	64.400	61.000	57.600	56.400	56.400	61.057	4.014	66.600	56.400
		VLAB C	Cumene	0.500		0.364	0.363	0.362	0.360	0.354	0.348	0.345	72.800	72.600	72.400	72.000	70.800	69.600	69.000	71.314	1.418	72.800	69.000
		VLAB D	Cumene	0.500		0.367	0.366	0.364	0.351	0.350	0.343	0.318	73.400	73.200	72.800	70.200	70.000	68.600	63.600	70.257	3.218	73.400	63.600
		VLAB E	Cumene	0.500		0.367	0.333	0.107	0.079	0.065	0.047	0.014	73.400	66.600	21.400	15.800	13.000	9.400	2.800	29.029	29.606	73.400	2.800
		VLAB F	Cumene	0.500		0.674	0.586	0.572	0.562	0.543	0.360	0.000	134.800	117.200	114.400	112.400	108.600	72.000	0.000	94.200	42.242	134.800	0.000
	232	VLAB A	Cyclohexanone	10.000	1.360	13.240	7.400	7.390	7.003	5.682	6.415	2.585	117.600	59.141	59.123	51.646	40.137	47.667	22.756	61.281	29.746	117.600	22.756
	232	VLAB B	Cyclohexanone	10.000		17.596	16.220	14.888	14.384	7.016	6.100	5.657	175.960	162.200	148.880	143.840	70.160	61.000	56.570	118.887	48.629	175.960	56.570
	232	VLAB C	Cyclohexanone	10.000	0.480	27.016	25.005	23.848	20.834	17.640	17.613	14.650	267.000	246.007	224.523	199.646	168.192	166.081	140.141	201.441	41.062	267.000	140.141
	232	VLAB D	Cyclohexanone	10.000		4.290	4.290	4.150	3.490	2.420	2.130	2.130	42.900	42.900	41.500	34.900	24.200	21.300	21.300	32.714	9.415	42.900	21.300
	232	VLAB E	Cyclohexanone	10.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	232	VLAB F	Cyclohexanone	10.000		27.329	27.100	26.004	24.955	23.540	21.940	20.582	273.290	271.000	260.040	249.550	235.400	219.400	205.820	244.929	23.900	273.290	205.820
	11	VLAB A	Dibromochloromethane	0.500	0.002	0.466	0.458	0.440	0.421	0.419	0.220	0.158	92.827	90.837	87.649	83.665	83.466	43.626	31.076	73.302	23.200	92.827	31.076
	11	VLAB B	Dibromochloromethane	0.500		0.334	0.327	0.327	0.326	0.322	0.303	0.287	66.800	65.400	65.400	65.200	64.400	60.600	57.400	63.600	3.162	66.800	57.400
		VLAB C	Dibromochloromethane	0.500		0.590	0.555	0.505	0.500	0.085	0.031	0.011	118.000	111.000	101.000	100.000	17.000	6.200	2.200	65.143	48.562	118.000	2.200
	11	VLAB D	Dibromochloromethane	0.500		0.446	0.421	0.421	0.417	0.381	0.361	0.357	89.200	84.200	84.200	83.400	76.200	72.200	71.400	80.114	6.332	89.200	71.400
	11	VLAB E	Dibromochloromethane	0.500		0.540	0.431	0.186	0.175	0.165	0.114	0.000	108.000	86.200	37.200	35.000	33.000	22.800	0.000	46.029	34.732	108.000	0.000
	11	VLAB F	Dibromochloromethane	0.500		0.844	0.731	0.709	0.672	0.651	0.189	0.000	168.800	146.200	141.800	134.400	130.200	37.800	0.000	108.457	56.650	168.800	0.000
U068	19	VLAB A	Dibromomethane	0.500	0.240	0.742	0.726	0.710	0.686	0.630	0.471	0.362	100.270	97.073	95.048	79.064	71.022	63.640	49.919	79.839	18.094	100.270	49.919
U068	19	VLAB B	Dibromomethane	0.500		0.375	0.363	0.344	0.336	0.331	0.324	0.316	75.000	72.600	68.800	67.200	66.200	64.800	63.200	68.257	3.910	75.000	63.200
U068	19	VLAB C	Dibromomethane	0.500		0.663	0.637	0.636	0.629	0.625	0.611	0.579	132.600	127.400	127.200	125.800	125.000	122.200	115.800	125.143	4.961	132.600	115.800
U068	19	VLAB D	Dibromomethane	0.520		0.491	0.483	0.477	0.463	0.429	0.402	0.394	94.423	92.885	91.731	89.038	82.500	77.308	75.769	86.236	7.096	94.423	75.769
U068	19	VLAB E	Dibromomethane	0.520		0.597	0.452	0.344	0.291	0.242	0.114	0.000	114.808	86.923	66.154	55.962	46.538	21.923	0.000	56.044	35.688	114.808	0.000
U068	19	VLAB F	Dibromomethane	0.520		0.962	0.847	0.833	0.831	0.794	0.778	0.709	185.000	162.885	160.192	159.808	152.692	149.615	136.346	158.077	13.775	185.000	136.346
U075	21	VLAB A	Dichlorodifluoromethane	1.000	3.846	2.720	1.949	1.705	1.477	1.393	1.252	0.516	56.129	40.210	35.184	30.479	28.745	25.836	10.648	32.463	12.902	56.129	10.648
U075	21	VLAB B	Dichlorodifluoromethane	1.000		0.313	0.290	0.267	0.230	0.229	0.153	0.084	31.300	29.000	26.700	23.000	22.900	15.300	8.400	22.371	7.448	31.300	8.400
U075	21	VLAB C	Dichlorodifluoromethane	1.000		0.327	0.284	0.219	0.212	0.170	0.160	0.140	32.700	28.400	21.900	21.200	17.000	16.000	14.000	21.843	6.980	32.700	14.000
U075	21	VLAB D	Dichlorodifluoromethane	1.000	1.200	0.404	0.394	0.307	0.269	0.260	0.242	0.125	18.364	17.909	13.955	12.227	11.818	11.000	5.682	12.994	4.024	18.364	5.682
U075	21	VLAB E	Dichlorodifluoromethane	1.000		1.250	0.651	0.572	0.254	0.251	0.196	0.000	125.000	65.100	57.200	25.400	25.100	19.600	0.000	45.343	39.516	125.000	0.000
U075	21	VLAB F	Dichlorodifluoromethane	1.000		4.132	0.000	0.000	0.000	0.000	0.000	0.000	413.200	0.000	0.000	0.000	0.000	0.000	0.000	59.029	144.590	413.200	0.000
		VLAB A	Dichloroethyl ether	5.000	0.784	6.855	6.577	5.918	5.370	4.840	3.065	2.082	118.517	113.710	102.317	92.842	83.692	52.991	35.996	85.838	28.000	118.517	35.996
		VLAB B	Dichloroethyl ether	5.000		14.830	14.166	13.507	12.685	3.633	3.570	3.340	296.600	283.320	270.140	253.700	72.660	71.400	66.800	187.803	102.472	296.600	66.800
		VLAB C	Dichloroethyl ether	5.000		7.183	6.807	6.332	5.978	4.352	4.348	4.190	143.660	136.140	126.640	119.560	87.040	86.960	83.800	111.971	23.017	143.660	83.800
		VLAB D	Dichloroethyl ether	5.000		2.840	2.820	2.740	2.600	2.430	2.240	2.060	56.800	56.400	54.800	52.000	48.600	44.800	41.200	50.657	5.579	56.800	41.200
		VLAB E	Dichloroethyl ether	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		VLAB F	Dichloroethyl ether	5.000		16.846	16.286	14.604	14.435	14.027	13.101	0.000	336.920	325.720	292.080	288.700	280.540	262.020	0.000	255.140	109.875	336.920	0.000
		VLAB A	Diethyl ether	5.000	0.148	11.432	6.968	6.073	5.644	4.082	2.549	2.503	222.067	135.354	117.968	109.635	79.293	49.514	48.621	108.922	55.583	222.067	48.621
		VLAB B	Diethyl ether	5.000		5.095	5.060	4.966	4.874	4.658	4.549	4.530	101.900	101.200	99.320	97.480	93.160	90.980	90.600	96.377	4.416	101.900	90.600
		VLAB C	Diethyl ether	5.000		4.263	4.180	3.992	3.897	3.837	3.512	3.403	85.260	83.600	79.840	77.940	76.740	70.240	68.060	77.383	6.021	85.260	68.060
		VLAB D	Diethyl ether	5.000		4.640	4.420	4.310	4.290	4.210	4.020	3.520	92.800	88.400	86.200	85.800	84.200	80.400	70.400	84.029	6.577	92.800	70.400
		VLAB E	Diethyl ether	5.000		0.763	0.496	0.451	0.214	0.142	0.077	0.000	15.260	9.920	9.020	4.280	2.840	1.540	0.000	6.123	5.064	15.260	0.000
		VLAB F	Diethyl ether	5.000		3.900	3.504	3.117	2.827	2.613	2.228	1.966	78.000	70.080	62.340	56.540	52.260	44.560	39.320	57.586	12.695	78.000	39.320
U112	225	VLAB A	Ethyl acetate	5.200	0.781	10.408	7.415	7.006	6.657	4.847	3.088	0.643	174.002	124.382	117.131	111.676	81.312	51.629	10.757	98.617	49.498	174.002	10.757
U112	225	VLAB B	Ethyl acetate	5.000		6.908	6.662	6.294	5.987	3.028	2.843	2.809	138.160	133.240	125.880	119.740	60.560	56.860	56.180	98.660	35.747	138.160	56.180

TABLE 3 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

VOLATILE ORGANICS

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
112	226	VLAB C	Ethyl acetate	5.000	1.302	7.512	7.483	7.379	6.674	6.707	4.784	4.699	117.706	117.262	115.622	104.573	99.423	74.481	72.082	98.733	18.647	117.706	72.082
112	226	VLAB D	Ethyl acetate	5.000		4.690	4.400	4.290	4.200	3.700	3.290	3.270	93.800	88.000	85.800	84.000	74.000	65.800	65.400	79.543	10.376	93.800	65.400
112	226	VLAB E	Ethyl acetate	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	226	VLAB F	Ethyl acetate	5.000		10.435	10.155	9.789	9.465	9.041	8.933	8.406	208.700	203.100	195.780	189.300	180.820	178.660	168.120	189.211	15.323	208.700	168.120
	226	VLAB A	Ethyl benzene	0.500	0.060	0.357	0.349	0.337	0.336	0.332	0.323	0.292	63.750	61.780	60.178	60.000	59.286	57.679	50.357	59.006	3.950	63.750	50.357
	226	VLAB B	Ethyl benzene	0.500		0.321	0.249	0.236	0.222	0.216	0.213	0.197	64.200	49.800	47.200	44.400	43.200	42.600	39.400	47.257	7.974	64.200	39.400
	226	VLAB C	Ethyl benzene	0.500		0.399	0.384	0.380	0.374	0.368	0.366	0.356	79.800	76.800	76.000	74.800	73.600	73.200	71.200	74.943	2.987	79.800	71.200
	226	VLAB D	Ethyl benzene	0.500	0.120	0.490	0.455	0.453	0.425	0.408	0.377	0.307	74.184	73.387	73.065	68.548	65.484	60.806	50.164	67.911	8.716	74.184	50.164
	226	VLAB E	Ethyl benzene	0.500		0.386	0.326	0.273	0.156	0.134	0.069	0.051	77.200	65.200	54.600	31.200	26.800	13.800	10.200	39.857	24.627	77.200	10.200
	226	VLAB F	Ethyl benzene	0.500	0.243	0.671	0.650	0.567	0.550	0.543	0.487	0.393	88.700	80.102	76.802	74.733	72.584	66.444	61.203	74.083	12.110	88.700	61.203
101	30	VLAB A	Ethyl cyanide	5.000		8.483	6.975	6.827	5.801	5.794	3.186	1.790	169.660	139.500	136.540	116.020	115.880	63.720	35.800	111.017	42.881	169.660	35.800
101	30	VLAB B	Ethyl cyanide	5.000		11.566	11.407	10.887	10.239	3.969	3.656	3.462	231.320	228.140	217.740	204.780	79.380	73.120	69.240	157.674	73.013	231.320	69.240
101	30	VLAB C	Ethyl cyanide	5.000		5.215	5.101	5.027	4.684	3.840	2.740	1.874	104.300	102.020	100.540	93.680	76.800	54.800	37.480	81.374	24.273	104.300	37.480
101	30	VLAB D	Ethyl cyanide	5.000		5.110	4.970	4.910	4.890	4.470	4.060	4.030	102.200	99.400	98.200	97.800	89.400	81.200	80.600	92.686	8.260	102.200	80.600
101	30	VLAB E	Ethyl cyanide	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
101	30	VLAB F	Ethyl cyanide	5.000		12.361	11.888	11.110	10.863	9.509	9.104	7.750	247.220	237.760	222.200	217.260	190.180	182.080	155.000	207.386	30.489	247.220	155.000
118	31	VLAB A	Ethyl methacrylate	0.500	0.042	1.222	1.009	0.984	0.797	0.779	0.735	0.499	225.481	195.600	177.080	147.048	143.173	135.600	91.329	160.913	39.630	225.481	91.329
118	31	VLAB B	Ethyl methacrylate	1.000		0.883	0.854	0.850	0.846	0.674	0.669	0.640	88.300	85.400	85.000	84.600	67.400	66.900	64.000	77.414	9.994	88.300	64.000
118	31	VLAB C	Ethyl methacrylate	1.000		0.967	0.964	0.956	0.899	0.890	0.860	0.830	96.700	96.400	95.600	89.900	89.000	86.000	83.000	90.957	5.294	96.700	83.000
118	31	VLAB D	Ethyl methacrylate	1.000		0.650	0.609	0.590	0.591	0.532	0.431	0.425	65.000	60.900	59.000	59.100	53.200	43.100	42.500	54.657	8.174	65.000	42.500
118	31	VLAB E	Ethyl methacrylate	1.000		1.320	1.150	0.970	0.650	0.270	0.214	0.107	132.000	115.000	97.000	65.000	27.000	21.400	10.700	66.871	42.629	132.000	10.700
118	31	VLAB F	Ethyl methacrylate	1.000		1.717	1.701	1.633	1.612	1.472	1.408	1.381	171.700	170.100	163.300	161.200	147.200	140.800	138.100	156.057	13.248	171.700	138.100
138	32	VLAB A	Iodomethane	1.000	0.180	1.250	1.129	1.109	0.969	0.959	0.559	0.449	105.218	94.940	93.330	81.060	80.040	46.296	37.790	77.118	23.603	105.218	37.790
138	32	VLAB B	Iodomethane	0.500		0.404	0.303	0.240	0.079	0.027	0.016	0.000	80.800	60.600	48.000	15.800	5.400	3.200	0.000	32.829	33.989	80.800	0.000
138	32	VLAB C	Iodomethane	0.500	0.036	0.264	0.257	0.226	0.225	0.225	0.213	0.199	49.071	47.770	42.007	41.622	41.622	39.591	36.431	42.648	4.083	49.071	36.431
138	32	VLAB D	Iodomethane	0.500		0.315	0.312	0.293	0.271	0.267	0.248	0.247	63.000	62.400	58.600	54.200	53.400	49.600	49.400	55.800	6.223	63.000	49.400
138	32	VLAB E	Iodomethane	0.500		2.050	0.913	0.666	0.466	0.291	0.163	0.142	410.000	182.600	133.200	93.200	58.200	32.600	28.400	134.029	122.637	410.000	28.400
138	32	VLAB F	Iodomethane	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
152	37	VLAB A	Methacrylonitrile	5.000		5.167	4.387	4.082	3.897	3.502	2.866	1.093	103.340	87.740	81.640	77.940	70.040	57.320	21.860	71.411	24.160	103.340	21.860
152	37	VLAB B	Methacrylonitrile	5.000	0.047	8.942	8.604	7.959	7.821	3.360	3.299	3.150	179.156	171.666	157.880	155.945	66.574	65.360	62.413	122.631	50.786	179.156	62.413
152	37	VLAB C	Methacrylonitrile	5.000		8.011	6.333	6.374	6.218	5.170	3.913	3.683	160.220	126.660	127.480	124.360	103.400	78.260	73.660	113.434	29.700	160.220	73.660
152	37	VLAB D	Methacrylonitrile	5.000		4.849	4.790	4.770	4.390	4.200	3.760	3.630	96.980	95.800	95.400	87.800	84.000	75.200	72.600	86.826	9.258	96.980	72.600
152	37	VLAB E	Methacrylonitrile	5.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
152	37	VLAB F	Methacrylonitrile	5.000		14.394	13.850	12.903	12.682	12.267	11.524	11.209	287.880	277.000	258.060	253.640	245.340	230.480	224.180	253.797	21.418	287.880	224.180
159	34	VLAB A	Methyl ethyl ketone	1.000	1.666	6.942	6.503	5.159	4.653	4.313	3.634	3.237	260.195	243.703	193.360	166.043	161.657	132.490	121.327	186.470	49.693	260.195	121.327
159	34	VLAB B	Methyl ethyl ketone	1.000	0.927	20.337	3.624	3.320	3.366	3.114	1.330	0.953	1055.371	189.964	172.290	171.862	161.590	69.019	49.456	266.790	325.099	1055.371	49.456
159	34	VLAB C	Methyl ethyl ketone	1.000	0.662	2.680	2.543	2.478	2.400	1.919	1.730	1.541	159.148	151.169	147.200	142.007	106.146	103.329	91.617	128.903	24.634	159.148	91.617
159	34	VLAB D	Methyl ethyl ketone	1.000	6.600	7.530	7.330	6.990	6.640	6.620	6.490	4.950	114.091	111.061	105.900	103.626	95.152	93.182	75.000	99.861	14.285	114.091	75.000
159	34	VLAB E	Methyl ethyl ketone	1.000		4.390	1.990	1.450	1.290	0.886	0.520	0.025	439.000	199.000	145.000	129.000	88.600	52.000	2.500	147.857	133.207	439.000	2.500
159	34	VLAB F	Methyl ethyl ketone	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
161	229	VLAB A	Methyl isobutyl ketone	1.000	0.115	1.294	1.203	1.072	0.969	0.904	0.616	0.084	116.054	115.984	96.143	86.439	72.100	55.420	7.534	78.808	38.522	116.054	7.534
161	229	VLAB B	Methyl isobutyl ketone	1.000		1.611	1.574	1.572	1.531	0.910	0.882	0.858	161.100	157.400	157.200	153.100	91.000	88.200	85.800	127.686	37.402	161.100	85.800
161	229	VLAB C	Methyl isobutyl ketone	1.000		1.404	1.329	1.321	1.293	1.227	1.211	1.211	140.400	132.900	132.100	129.300	122.700	121.100	121.100	128.514	6.737	140.400	121.100
161	229	VLAB D	Methyl isobutyl ketone	1.000		1.010	0.999	0.919	0.822	0.757	0.656	0.630	101.000	99.900	91.900	82.200	75.700	65.600	63.000	82.771	14.317	101.000	63.000
161	229	VLAB E	Methyl isobutyl ketone	1.000		2.640	2.120	0.506	0.334	0.310	0.230	0.001	264.000	212.000	50.600	33.400	31.000	23.000	0.100	87.729	95.663	264.000	0.100
161	229	VLAB F	Methyl isobutyl ketone	1.000		2.613	2.491	2.483	2.478	2.472	2.066	1.736	261.300	249.100	248.300	247.800	247.200	206.600	173.600	233.414	32.509	261.300	173.600
162	35	VLAB A	Methyl methacrylate	1.000	0.025	1.072	0.964	0.931	0.743	0.736	0.676	0.466	104.585	94.049	90.829	72.486	71.805	65.951	45.058	77.900	19.473	104.585	45.058
162	35	VLAB B	Methyl methacrylate	1.000		1.189	1.127	1.123	1.073	0.667	0.629	0.604	118.900	112.700	112.300	107.300	66.700	62.900	60.400	91.600	24.716	118.900	60.400
162	35	VLAB C	Methyl methacrylate	1.000		1.600	1.548	1.433	1.250	1.226	1.149	1.074	160.000	154.800	143.300	125.000	122.600	114.900	107.400	132.571	18.887	160.000	107.400
162	35	VLAB D	Methyl methacrylate	1.000		0.830	0.790	0.761	0.709	0.693	0.619	0.596	83.000	79.000	76.100	70.900	69.300	61.900	59.600	71.243	7.877	83.000	59.600
162	35	VLAB E	Methyl methacrylate	1.000		1.520	1.310	1.240	0.900	0.341	0.202	0.000	152.000	131.000	124.000	90.000	34.100	20.200	0.000	78.757	56.524	152.000	0.000
162	35	VLAB F	Methyl methacrylate	1.000		0.954	0.939	0.877	0.840	0.826	0.820	0.720	95.400	93.900	87.700	84.000	82.600	82.000	72.000	85.371	7.353	95.400	72.000
40	38	VLAB A	Methylene chloride	0.500	2.231	4.178	2.411	2.382	2.124	1.848	1.558	1.256	152.994	88.293	87.221	77.774	67.000	57.000	45.990	82.429	32.171	152.994	45.990
80	38	VLAB B	Methylene chloride	0.500		0.579	0.545	0.490	0.451	0.446	0.419	0.390	115.800	109.000	98.000	90.200	89.200	83.800	78.000	94.857	12.452	115.800	78.000
10	38	VLAB C	Methylene chloride	0.500	13.061	1.543	0.766	0.756	0.733	0.699	0.674	0.638	11.301	5.640	5.567	5.307	5.147	4.963	4.089	6.110	2.186	11.301	4.089
10	38	VLAB D	Methylene chloride	0.500	0.210	0.500	0.580	0.545	0.540	0.532	0.527	0.505	83.099	81.696	76.761	79.656	74.930	74.225	71.127	76.841	3.886	83.099	71.127

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
11080	38	VLAB E	Methylene chloride	0.500		0.404	0.357	0.308	0.204	0.098	0.086	0.026	80.800	71.400	61.600	40.800	19.600	17.200	5.200	42.371	27.325	80.800	5.200
11080	38	VLAB F	Methylene chloride	0.500	0.804	0.539	0.485	0.401	0.358	0.186	0.161	0.132	41.334	37.193	30.752	27.454	14.264	12.347	10.123	24.781	11.858	41.334	10.123
11210	42	VLAB A	Tetrachloroethene	0.500	0.144	0.583	0.552	0.546	0.545	0.539	0.435	0.394	90.528	85.714	84.783	84.627	83.696	67.547	61.180	79.725	10.872	90.528	61.180
11210	42	VLAB B	Tetrachloroethene	0.500	0.028	0.415	0.409	0.393	0.387	0.378	0.375	0.371	78.598	77.462	74.432	73.295	71.591	71.023	70.265	73.810	2.980	78.598	70.265
11210	42	VLAB C	Tetrachloroethene	0.500	0.328	0.494	0.490	0.490	0.487	0.486	0.474	0.470	59.662	59.179	59.179	58.816	58.696	57.246	56.763	58.506	1.000	59.662	56.763
11210	42	VLAB D	Tetrachloroethene	0.500	0.104	0.598	0.568	0.562	0.553	0.548	0.465	0.436	99.014	94.079	93.002	91.556	90.692	77.000	72.190	88.219	9.200	99.014	72.190
11210	42	VLAB E	Tetrachloroethene	0.500		0.459	0.409	0.090	0.000	0.000	0.000	0.000	91.800	81.800	18.000	0.000	0.000	0.000	0.000	27.371	38.169	91.800	0.000
11210	42	VLAB F	Tetrachloroethene	0.500		1.053	1.019	0.948	0.918	0.898	0.867	0.843	210.600	203.800	189.600	183.600	179.600	173.400	168.600	187.029	14.320	210.600	168.600
11220	43	VLAB A	Toluene	0.500	0.615	0.966	0.891	0.825	0.770	0.689	0.623	0.482	86.637	79.910	73.991	69.058	61.794	55.874	43.229	67.213	13.737	86.637	43.229
11220	43	VLAB B	Toluene	0.500	0.472	0.948	0.750	0.747	0.742	0.731	0.720	0.716	97.531	77.160	76.852	76.337	75.206	74.074	73.663	78.690	7.792	97.531	73.663
11220	43	VLAB C	Toluene	0.500	1.411	1.053	1.052	1.045	0.993	0.978	0.974	0.972	55.102	55.050	54.683	51.962	51.177	50.968	50.863	52.829	1.865	55.102	50.863
11220	43	VLAB D	Toluene	0.500	0.200	0.743	0.830	0.841	7.301	7.311	0.711	0.561	170.838	161.764	149.042	129.140	120.283	117.737	115.105	137.701	19.975	170.838	115.105
11220	43	VLAB E	Toluene	0.500		1.090	1.048	0.850	0.757	0.725	0.676	0.536	218.000	209.600	170.000	151.400	145.000	135.200	107.200	162.343	30.720	218.000	107.200
11220	43	VLAB F	Toluene	0.500	1.027	1.435	1.387	1.359	1.350	1.317	1.194	0.787	93.975	90.832	88.998	88.409	86.248	78.193	51.539	82.599	13.360	93.975	51.539
11078	25	VLAB A	trans-1,2-Dichloroethene	0.500		1.160	1.078	1.056	0.998	0.615	0.429	0.406	232.000	215.600	211.200	199.600	123.000	85.800	81.200	164.057	60.257	232.000	81.200
11078	25	VLAB B	trans-1,2-Dichloroethene	0.500		0.136	0.133	0.128	0.096	0.078	0.017	0.000	27.200	26.600	25.600	19.200	15.600	3.400	0.000	16.800	10.355	27.200	0.000
11078	25	VLAB C	trans-1,2-Dichloroethene	0.500		0.229	0.217	0.201	0.192	0.192	0.185	0.179	45.800	43.400	40.200	38.400	38.400	37.000	35.800	39.857	3.314	45.800	35.800
11078	25	VLAB D	trans-1,2-Dichloroethene	0.500		0.322	0.313	0.310	0.305	0.301	0.272	0.270	64.400	62.600	62.000	61.000	60.200	54.400	54.000	59.800	3.783	64.400	54.000
11078	25	VLAB E	trans-1,2-Dichloroethene	0.500		0.527	0.321	0.288	0.265	0.082	0.065	0.000	105.400	64.200	57.600	53.000	16.400	13.000	0.000	44.229	34.056	105.400	0.000
11078	25	VLAB F	trans-1,2-Dichloroethene	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11084	27	VLAB A	trans-1,3-Dichloropropene	0.500		0.533	0.510	0.477	0.391	0.366	0.350	0.193	106.600	102.000	95.400	78.200	73.200	70.000	38.600	80.571	21.679	106.600	38.600
11084	27	VLAB B	trans-1,3-Dichloropropene	1.000		0.640	0.635	0.606	0.589	0.558	0.556	0.534	64.000	63.500	60.600	58.900	55.800	55.600	53.400	58.829	3.924	64.000	53.400
11084		VLAB C	trans-1,3-Dichloropropene	0.500		0.594	0.584	0.575	0.562	0.545	0.541	0.523	118.800	116.800	115.000	112.400	109.000	108.200	104.600	112.114	4.728	118.800	104.600
11084	27	VLAB D	trans-1,3-Dichloropropene	0.500		0.438	0.433	0.429	0.403	0.391	0.360	0.348	87.600	86.600	85.800	80.600	78.200	72.000	69.600	80.057	6.664	87.600	69.600
11084	27	VLAB E	trans-1,3-Dichloropropene	0.500		0.437	0.413	0.289	0.172	0.137	0.064	0.000	87.400	82.600	57.800	34.400	27.400	12.800	0.000	43.200	31.252	87.400	0.000
11084	27	VLAB F	trans-1,3-Dichloropropene	0.500		0.821	0.749	0.709	0.701	0.701	0.672	0.632	164.200	149.800	141.800	140.200	140.200	134.400	126.400	142.429	11.024	164.200	126.400
11074	20	VLAB A	trans-1,4-Dichloro-2-butene	1.000	0.044	1.101	1.019	0.999	0.971	0.903	0.890	0.528	105.460	97.605	95.690	93.008	86.494	85.249	50.575	87.726	16.435	105.460	50.575
11074	20	VLAB B	trans-1,4-Dichloro-2-butene	1.000		0.645	0.622	0.331	0.109	0.091	0.000	0.003	64.500	62.200	33.100	10.900	9.100	0.000	0.300	25.729	22.090	64.500	0.000
11074	20	VLAB C	trans-1,4-Dichloro-2-butene	1.000		0.911	0.881	0.866	0.830	0.721	0.487	0.396	91.100	88.100	86.600	83.000	72.100	48.700	39.600	72.743	19.075	91.100	39.600
11074	20	VLAB D	trans-1,4-Dichloro-2-butene	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11074	20	VLAB E	trans-1,4-Dichloro-2-butene	1.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11074	20	VLAB F	trans-1,4-Dichloro-2-butene	1.000		2.507	2.351	2.105	2.004	1.892	1.689	0.000	250.700	235.100	210.500	200.400	189.200	168.900	0.000	179.257	77.446	250.700	0.000
11225	44	VLAB A	Tribromomethane (Bromoform)	0.500	0.007	0.420	0.411	0.401	0.395	0.391	0.207	0.154	82.840	81.065	79.093	77.909	77.120	40.828	30.375	67.033	20.152	82.840	30.375
11225	44	VLAB B	Tribromomethane (Bromoform)	0.500		0.234	0.234	0.224	0.200	0.182	0.177	0.155	46.800	46.800	44.800	40.000	36.400	35.400	31.000	40.171	5.598	46.800	31.000
11225	44	VLAB C	Tribromomethane (Bromoform)	0.500		0.541	0.529	0.511	0.505	0.500	0.495	0.460	108.200	105.800	102.200	101.000	100.000	99.000	92.000	101.171	4.812	108.200	92.000
11225	44	VLAB D	Tribromomethane (Bromoform)	0.500		0.402	0.394	0.389	0.376	0.346	0.311	0.307	80.400	78.800	77.800	75.200	69.200	62.200	61.400	72.143	7.337	80.400	61.400
11225	44	VLAB E	Tribromomethane (Bromoform)	0.500		0.585	0.581	0.134	0.090	0.037	0.034	0.000	117.000	116.200	26.800	18.000	7.400	6.800	0.000	41.743	47.703	117.000	0.000
11225	44	VLAB F	Tribromomethane (Bromoform)	0.500		0.851	0.765	0.747	0.722	0.710	0.635	0.000	170.200	153.000	149.400	144.400	142.000	127.000	0.000	126.514	64.186	170.200	0.000
11228	47	VLAB A	Trichloroethene	0.500	0.121	0.597	0.584	0.576	0.521	0.516	0.458	0.273	96.135	94.042	92.754	83.897	83.092	73.752	43.961	81.090	16.755	96.135	43.961
11228	47	VLAB B	Trichloroethene	0.500		0.979	0.682	0.610	0.560	0.515	0.505	0.501	195.800	136.400	122.000	112.000	103.000	101.000	100.200	124.343	31.643	195.800	100.200
11228	47	VLAB C	Trichloroethene	0.500	0.105	0.659	0.655	0.650	0.650	0.614	0.605	0.600	108.926	108.264	107.438	107.438	101.488	100.000	99.174	104.675	3.937	108.926	99.174
11228	47	VLAB D	Trichloroethene	0.500		0.709	0.657	0.651	0.645	0.621	0.585	0.536	141.800	131.400	130.200	129.000	124.200	117.000	107.200	125.829	10.163	141.800	107.200
11228	47	VLAB E	Trichloroethene	0.500		0.747	0.552	0.472	0.464	0.218	0.106	0.050	149.400	110.400	94.400	92.800	43.600	21.200	10.000	74.543	45.375	149.400	10.000
11228	47	VLAB F	Trichloroethene	0.500		1.393	1.366	1.161	1.160	1.140	1.124	1.116	278.600	273.200	232.200	232.000	228.000	224.800	223.200	241.714	21.720	278.600	223.200
1121	48	VLAB A	Trichlorofluoromethane	0.500	0.265	1.241	1.079	0.970	0.670	0.566	0.555	0.348	162.222	141.046	126.797	87.582	73.987	72.549	45.490	101.382	39.319	162.222	45.490
1121	48	VLAB B	Trichlorofluoromethane	0.500		0.456	0.453	0.435	0.421	0.399	0.391	0.377	91.200	90.600	87.000	84.200	79.800	78.200	75.400	83.771	5.654	91.200	75.400
1121	48	VLAB C	Trichlorofluoromethane	0.500		0.751	0.734	0.694	0.687	0.684	0.676	0.665	150.200	146.800	138.800	137.400	136.800	135.200	133.000	139.743	5.763	150.200	133.000
1121	48	VLAB D	Trichlorofluoromethane	0.500		0.191	0.176	0.176	0.176	0.154	0.151	0.146	38.200	35.200	35.200	35.200	30.800	30.200	29.200	33.429	3.103	38.200	29.200
1121	48	VLAB E	Trichlorofluoromethane	0.500		2.590	0.416	0.376	0.352	0.350	0.306	0.191	518.000	83.200	75.200	70.400	70.000	61.200	38.200	130.886	158.585	518.000	38.200
1121	48	VLAB F	Trichlorofluoromethane	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1043	88	VLAB A	Vinyl chloride	1.000		1.455	1.170	1.137	1.068	0.881	0.581	0.410	145.500	117.000	113.700	106.800	88.100	58.100	41.000	95.743	33.531	145.500	41.000
1043	88	VLAB B	Vinyl chloride	1.000		0.535	0.450	0.446	0.436	0.411	0.370	0.275	53.500	45.000	44.600	43.600	41.100	37.000	27.500	41.757	7.378	53.500	27.500
1043	88	VLAB C	Vinyl chloride	1.000		0.509	0.457	0.439	0.428	0.371	0.349	0.327	50.900	45.700	43.900	42.800	37.100	34.900	32.700	41.143	6.011	50.900	32.700
1043	88	VLAB D	Vinyl chloride	0.500		0.092	0.076	0.070	0.059	0.039	0.037	0.037	18.400	15.200	14.000	11.800	7.800	7.400	7.400	11.714	4.047	18.400	7.400
1043	88	VLAB E	Vinyl chloride	0.500		0.761	0.759	0.406	0.333	0.204	0.067	0.000	152.200	151.800	81.200	66.600	40.800	13.400	0.000	72.286	60.701	152.200	0.000
1043	88	VLAB F	Vinyl chloride	0.500		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND. DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
VOLATILE ORGANICS																							
U239	215	VLAB A	Xylene	0.500	0.021	0.932	0.903	0.857	0.840	0.838	0.813	0.788	91.293	90.443	83.837	82.000	81.881	79.828	77.170	83.802	4.821	91.293	77.170
U239	215	VLAB B	Xylene	0.500		1.066	0.452	0.317	0.229	0.190	0.186	0.161	213.200	90.400	63.400	45.800	38.000	37.200	32.200	74.314	60.700	213.200	32.200
U239	215	VLAB C	Xylene	0.500	0.167	0.603	0.464	0.493	0.400	0.463	0.477	0.442	76.412	74.083	73.813	72.864	72.414	71.514	66.267	72.350	2.744	76.412	66.267
U239	215	VLAB D	Xylene	0.500		0.594	0.460	0.363	0.327	0.306	0.282	0.272	118.800	92.000	72.600	65.400	61.200	56.400	54.400	74.400	21.010	118.800	54.400
U239	215	VLAB E	Xylene	0.500		0.365	0.329	0.304	0.118	0.077	0.062	0.053	73.000	65.800	60.800	23.600	15.400	12.400	10.600	37.257	26.010	73.000	10.600
U239	215	VLAB F	Xylene	0.500	0.387	1.884	1.667	1.371	1.364	1.327	0.787	0.526	192.699	189.739	186.151	187.324	183.057	91.020	69.664	149.033	42.932	192.699	69.664

TABLE E 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP 1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP 1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
U207	148	LAB A	1,2,4,5-Tetrachlorobenzene	0.400	0.137	0.670	0.611	0.573	0.572	0.536	0.449	0.199	124.767	113.700	100.704	100.010	90.020	93.010	37.000	96.010	20.702	124.767	37.000
U207	148	LAB B	1,2,4,5-Tetrachlorobenzene	0.400		0.0695	0.0101	0.0063	0.0034	0.5032	0.4774	0.4618	107.125	104.775	127.075	125.550	125.000	119.260	115.450	133.032	10.081	167.125	115.400
U207	148	LAB C	1,2,4,5-Tetrachlorobenzene	0.400	0.000	0.610	0.599	0.567	0.592	0.543	0.408	0.418	152.500	149.750	140.750	148.500	135.750	118.290	104.500	135.143	18.794	152.500	104.000
U207	148	LAB D	1,2,4,5-Tetrachlorobenzene	0.400		0.643	0.627	0.565	0.607	0.561	0.619	0.400	169.750	156.750	140.250	141.750	137.750	120.000	124.000	142.265	12.410	169.750	124.000
U207	148	LAB E	1,2,4,5-Tetrachlorobenzene	0.400	0.000	0.682	0.699	0.657	0.612	0.600	0.579	0.556	173.000	167.250	164.250	153.000	152.250	144.700	100.000	160.214	11.470	173.000	120.000
U207	148	LAB F	1,2,4,5-Tetrachlorobenzene	0.400	0.002	0.398	0.371	0.356	0.364	0.340	0.330	0.391	81.000	76.971	73.051	73.444	72.407	70.184	66.000	73.588	4.030	81.000	66.000
	150	LAB A	1,2,4-Trichlorobenzene	0.400	0.104	0.676	0.623	0.264	0.341	0.310	0.266	0.110	134.584	163.770	72.222	67.660	63.095	83.176	83.011	74.000	35.133	134.584	23.011
	150	LAB B	1,2,4-Trichlorobenzene	0.400		0.4630	0.4294	0.4261	0.4121	0.3600	0.3700	0.3738	113.450	107.300	107.025	103.025	87.000	94.000	93.375	102.230	8.836	113.450	93.375
	150	LAB C	1,2,4-Trichlorobenzene	0.400	0.000	0.603	0.651	0.602	0.603	0.579	0.664	0.406	165.750	162.700	160.600	145.750	144.750	130.000	124.000	147.043	12.073	165.750	124.000
	150	LAB D	1,2,4-Trichlorobenzene	0.400		0.714	0.650	0.641	0.632	0.614	0.601	0.672	170.500	142.000	160.250	160.000	153.500	160.250	143.000	150.000	10.367	170.500	143.000
	150	LAB E	1,2,4-Trichlorobenzene	0.400	0.110	0.623	0.600	0.575	0.570	0.567	0.492	0.465	122.157	113.720	112.745	111.700	111.170	90.471	91.170	100.450	8.800	122.157	91.170
	150	LAB F	1,2,4-Trichlorobenzene	0.400		0.416	0.415	0.393	0.300	0.380	0.340	0.344	104.000	103.750	98.250	97.250	96.500	87.250	86.000	90.143	8.020	104.000	86.000
U070	87	LAB A	1,2-Dichlorobenzene	2.000	0.707	2.077	2.134	2.026	1.801	1.645	1.403	0.044	104.353	77.403	73.440	89.075	88.000	83.000	23.360	84.010	28.872	104.353	23.360
U070	87	LAB B	1,2-Dichlorobenzene	2.000		1.0400	1.0190	1.0035	1.0021	1.0010	1.0014	1.0621	97.340	95.075	93.275	93.100	83.095	70.070	77.000	90.496	7.890	97.340	77.000
U070	87	LAB C	1,2-Dichlorobenzene	2.000	0.630	2.416	2.352	2.307	2.210	2.200	2.150	2.100	91.825	99.430	87.710	84.375	83.854	83.110	82.471	90.127	3.290	91.825	82.471
U070	87	LAB D	1,2-Dichlorobenzene	2.000		3.031	2.871	2.858	2.700	2.750	2.700	2.626	151.550	140.550	142.050	139.000	137.000	135.000	131.260	141.000	8.704	151.550	131.760
U070	87	LAB E	1,2-Dichlorobenzene	2.000	0.885	2.307	2.288	2.130	1.999	1.844	1.843	1.710	99.240	87.000	92.300	78.044	71.336	71.250	66.400	77.011	8.122	99.240	66.400
U070	87	LAB F	1,2-Dichlorobenzene	2.000		2.620	2.316	2.227	2.044	2.014	1.844	0.000	120.300	115.000	111.300	102.200	170.700	77.200	0.000	90.087	30.077	120.300	0.000
	107	LAB A	1,2-Diphenylhydrazine	100.000	0.000	44.324	44.088	43.483	43.240	42.400	30.371	20.250	44.324	44.088	43.483	43.240	42.400	30.371	20.250	30.401	0.857	44.324	20.250
	107	LAB B	1,2-Diphenylhydrazine	100.000		62.7333	33.0087	32.4701	30.8747	30.2562	26.9400	20.0130	62.733	33.000	32.470	30.875	30.255	26.940	20.013	33.020	7.830	62.733	20.013
	107	LAB C	1,2-Diphenylhydrazine	100.000	0.300	170.114	104.028	150.560	133.447	132.042	124.867	69.029	169.605	104.134	160.064	133.040	132.044	124.214	69.451	134.440	34.083	169.605	69.451
	107	LAB D	1,2-Diphenylhydrazine	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	107	LAB E	1,2-Diphenylhydrazine	100.000	0.000	27.043	20.272	23.844	22.100	21.000	20.044	10.326	27.042	20.272	23.844	22.100	21.500	20.044	10.326	23.000	2.000	27.042	10.326
	107	LAB F	1,2-Diphenylhydrazine	100.000		43.570	25.650	0.000	0.000	0.000	0.000	0.000	43.570	25.650	0.000	0.000	0.000	0.000	0.000	0.000	16.353	43.570	0.000
U071	88	LAB A	1,3-Dichlorobenzene	2.000	0.000	1.650	1.605	1.573	1.250	1.150	1.114	0.417	82.000	80.250	78.600	62.500	57.050	55.700	20.050	62.000	19.907	82.000	29.050
U071	88	LAB B	1,3-Dichlorobenzene	2.000		1.4457	1.3582	1.2330	1.2201	1.2213	1.1380	1.0700	72.285	67.910	61.650	61.455	61.065	56.045	63.945	62.170	8.760	72.285	63.945
U071	88	LAB C	1,3-Dichlorobenzene	2.000	0.000	1.713	1.572	1.480	1.400	1.482	1.473	1.470	85.650	78.000	74.400	74.300	74.100	73.650	73.000	78.214	4.141	85.650	73.300
U071	88	LAB D	1,3-Dichlorobenzene	2.000		2.140	2.030	1.833	1.930	1.666	1.026	1.745	107.000	101.000	88.650	96.500	94.250	91.250	67.290	96.380	6.083	107.000	67.250
U071	88	LAB E	1,3-Dichlorobenzene	2.000	0.040	1.373	1.270	1.220	1.210	1.200	1.150	1.084	67.304	62.540	89.004	60.755	60.110	50.087	63.137	60.762	4.115	67.304	63.137
U071	88	LAB F	1,3-Dichlorobenzene	2.000		1.327	1.253	1.242	1.173	1.101	1.004	1.086	98.350	62.650	62.100	58.650	55.050	54.200	63.300	60.000	4.000	98.350	63.300
U072	89	LAB A	1,4-Dichlorobenzene	4.000	0.270	2.070	2.284	2.104	2.033	1.090	1.400	0.590	67.213	63.021	40.274	47.377	37.011	32.707	14.000	43.044	16.000	67.213	14.000
U072	89	LAB B	1,4-Dichlorobenzene	4.000		2.7710	2.6405	2.0669	2.4088	2.3066	2.2031	2.2214	89.275	66.013	64.173	62.220	57.663	56.076	66.035	61.020	4.024	89.275	66.035
U072	89	LAB C	1,4-Dichlorobenzene	4.000	0.000	3.640	3.518	3.432	3.372	3.370	3.211	3.170	91.150	87.075	85.800	84.300	84.250	80.275	70.475	84.732	3.782	91.150	70.475
U072	89	LAB D	1,4-Dichlorobenzene	4.000		4.288	4.123	4.097	3.900	3.866	3.061	3.080	107.225	103.075	102.425	99.150	90.075	96.525	92.295	90.020	4.804	107.225	92.295
U072	89	LAB E	1,4-Dichlorobenzene	4.000	0.223	3.107	2.863	2.704	2.770	2.812	2.900	2.441	73.300	67.635	65.700	65.430	60.343	50.272	67.000	64.075	6.222	73.390	67.000
U072	89	LAB F	1,4-Dichlorobenzene	4.000		3.108	2.837	2.647	2.561	2.487	2.110	2.061	77.025	70.925	66.175	64.025	61.425	62.000	61.275	63.470	0.007	77.025	61.275
	99	LAB A	1,4-Dinitrobenzene	10.000	0.000	10.200	9.970	9.779	9.683	0.683	0.644	0.342	102.000	9.700	7.700	6.930	6.830	6.440	3.420	20.444	33.340	102.000	3.420
	99	LAB B	1,4-Dinitrobenzene	10.000		7.4230	0.4550	0.1880	6.0740	0.0230	4.8200	3.0163	74.230	94.550	81.000	60.740	65.230	48.200	30.163	87.300	10.002	74.230	30.163
	99	LAB C	1,4-Dinitrobenzene	10.000	0.000	11.070	11.553	11.240	10.500	0.880	0.743	0.903	110.700	115.530	112.400	106.000	91.000	87.430	60.030	101.140	16.560	110.700	60.030
	99	LAB D	1,4-Dinitrobenzene	10.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	99	LAB E	1,4-Dinitrobenzene	10.000	0.000	10.010	9.202	9.643	9.584	0.575	0.483	0.330	100.170	92.020	96.430	95.840	85.700	84.630	93.300	90.730	5.300	100.190	91.300
	99	LAB F	1,4-Dinitrobenzene	10.000		9.633	9.779	9.718	9.192	0.174	0.110	9.070	96.330	97.790	97.180	91.920	91.740	91.100	90.700	94.130	3.103	96.330	60.700
U167	123	LAB A	1-Naphthylamine	100.000	0.000	11.103	8.801	7.024	6.833	0.030	4.024	0.948	11.103	8.801	7.024	6.833	6.030	4.024	0.548	6.510	3.001	11.103	0.548
U167	123	LAB B	1-Naphthylamine	100.000		1107.410	930.6170	700.1030	888.4240	590.4020	807.0780	437.1230	1107.410	930.617	700.103	888.424	590.402	807.078	437.123	795.964	290.037	1107.410	437.123
U167	123	LAB C	1-Naphthylamine	100.000	0.000	20.070	20.011	20.305	17.910	10.032	13.282	5.020	20.070	20.011	20.305	17.910	10.032	13.282	5.020	10.493	6.332	20.070	5.000
U167	123	LAB D	1-Naphthylamine	100.000		5.000	5.742	4.940	4.540	4.380	2.423	0.045	5.000	5.742	4.940	4.540	4.380	2.423	0.045	4.042	1.753	5.000	0.045
U167	123	LAB E	1-Naphthylamine	100.000	0.000	7.250	6.747	5.032	0.600	0.172	5.730	5.266	7.250	6.747	5.032	0.600	0.172	5.730	5.266	6.300	0.620	7.250	5.266
U167	123	LAB F	1-Naphthylamine	100.000		12.820	12.820	10.020	8.500	0.070	0.000	5.000	12.820	12.820	10.020	8.500	0.070	0.000	5.000	0.336	2.020	12.820	5.000
	140	LAB A	2,3,4,6-Tetrachlorophenol	100.000	0.000	32.016	32.584	29.105	25.700	25.500	24.540	10.775	32.016	32.584	29.105	25.700	25.500	24.540	10.775	26.720	9.057	32.016	10.775
	140	LAB B	2,3,4,6-Tetrachlorophenol	100.000		31.5118	29.4237	28.1337	23.3670	21.5753	21.2303	10.0327	31.512	29.424	28.134	23.367	21.575	21.230	10.020	24.464	8.070	31.512	10.033
	140	LAB C	2,3,4,6-Tetrachlorophenol	100.000	0.000	205.410	146.424	118.581	97.402	90.782	38.290	34.000	205.410	146.424	118.581	97.402	90.752	38.290	34.000	104.241	65.004	205.410	34.000
	140	LAB D	2,3,4,6-Tetrachlorophenol	100.000		53.816	53.010	48.872	43.210	40.075	34.890	34.076	53.816	53.010	48.872	43.210	40.075	34.890	34.076	43.031	7.324	53.016	34.076
	140	LAB E	2,3,4,6-Tetrachlorophenol	100.000	0.000	66.902	64.388	63.017	62.088	55.031	54.521	44.580	66.902	64.388	63.017	62.088	55.031	54.521	44.580	59.083	7.100	66.902	44.580
	140	LAB F	2,3,4,6-Tetrachlorophenol	100.000		26.251	22.757	22.054	21.040	20.087	19.284	17.050	26.251	22.757	22.054	21.040	20.087	19.284	17.050	21.440	2.404	26.251	17.050
	151	LAB A	2,4,5-Trichlorophenol	5.000	0.000	4.330	3.810	3.667	3.546	3.471	3.266	1.257	86.760	76.380	73.340	70.900	69.420	65.200	25.140	69.761	10.100	86.760	25.140
	151	LAB B	2,4,5-Trichlorophenol	5.000		4.3206	3.7867	3.6925	3.4988	3.3870	3.0270	2.2036	88.410	75.734	73.600	69.900	67.940	60.750	45.070	66.651	11.000	88.410	45.010

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

IV NONVOLATILE ORGANICS

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
	151	LAB C	2,4,5-Trichlorophenol	5.000	0.000	5.693	5.552	5.395	4.885	4.747	4.059	2.943	113.860	111.040	107.900	97.700	94.940	81.180	58.860	95.184	19.130	113.860	58.860
	151	LAB D	2,4,5-Trichlorophenol	5.000		4.874	4.602	4.552	4.193	3.638	3.037	2.075	97.480	92.040	91.040	83.860	72.760	60.740	41.500	77.060	19.084	97.480	41.500
	151	LAB E	2,4,5-Trichlorophenol	5.000	0.000	6.141	5.772	5.146	5.104	5.058	4.786	4.404	122.820	115.440	102.920	102.080	101.160	95.720	88.080	104.031	10.823	122.820	88.080
	151	LAB F	2,4,5-Trichlorophenol	5.000		5.028	2.930	2.395	2.261	2.147	1.889	1.888	100.560	58.600	47.900	45.220	42.940	37.780	37.760	53.020	22.517	100.560	37.760
	152	LAB A	2,4,6-Trichlorophenol	5.000	0.000	5.652	5.185	5.131	4.832	4.509	4.351	1.911	113.040	103.700	102.620	96.640	90.180	87.020	38.220	90.207	22.710	113.040	38.220
	152	LAB B	2,4,6-Trichlorophenol	5.000		4.3290	4.2076	4.0220	3.5938	3.0870	2.9730	2.0025	86.580	84.152	80.440	71.876	61.740	59.460	40.050	69.273	16.237	86.580	40.050
	152	LAB C	2,4,6-Trichlorophenol	5.000	0.000	6.745	6.371	6.105	6.067	5.545	4.302	3.735	134.900	127.420	122.100	121.340	110.900	86.040	74.700	111.060	20.722	134.900	74.700
	152	LAB D	2,4,6-Trichlorophenol	5.000		3.933	3.724	3.671	3.627	3.600	3.544	3.217	78.660	74.480	73.420	72.540	72.000	70.880	64.340	72.046	3.807	78.660	64.340
	152	LAB E	2,4,6-Trichlorophenol	5.000	0.000	5.485	5.213	5.030	4.970	4.933	4.828	4.445	109.700	104.260	100.600	99.400	98.660	96.560	88.900	99.726	6.807	109.700	88.900
	152	LAB F	2,4,6-Trichlorophenol	5.000		3.167	2.946	2.134	2.045	1.954	1.857	1.185	63.340	58.920	42.680	40.900	39.080	37.140	23.700	41.223	9.613	63.340	23.700
U081	90	LAB A	2,4-Dichlorophenol	0.200	0.000	0.236	0.227	0.171	0.170	0.120	0.041	0.000	118.000	113.500	85.500	85.000	60.000	20.500	0.000	70.286	41.424	118.000	0.000
U081	90	LAB B	2,4-Dichlorophenol	0.200		0.2150	0.1930	0.1910	0.1794	0.1706	0.1501	0.1200	107.500	96.500	95.500	89.700	85.300	75.050	60.000	87.079	12.204	107.500	60.000
U081	90	LAB C	2,4-Dichlorophenol	0.200	0.000	0.275	0.208	0.000	0.000	0.000	0.000	0.000	137.500	104.000	0.000	0.000	0.000	0.000	0.000	34.571	58.280	137.500	0.000
U081	90	LAB D	2,4-Dichlorophenol	0.200		0.124	0.115	0.113	0.109	0.097	0.075	0.012	62.000	57.500	56.500	54.500	48.500	37.500	6.000	46.071	17.926	62.000	6.000
U081	90	LAB E	2,4-Dichlorophenol	0.200	0.030	0.218	0.210	0.203	0.201	0.200	0.190	0.178	109.000	105.000	101.500	100.500	100.000	95.000	89.000	99.857	6.295	109.000	89.000
U081	90	LAB F	2,4-Dichlorophenol	0.200		0.188	0.177	0.168	0.168	0.158	0.157	0.147	94.000	88.500	84.000	84.000	79.000	78.500	73.500	83.071	6.321	94.000	73.500
U101	98	LAB A	2,4-Dimethyl phenol	0.200	0.000	0.225	0.224	0.219	0.219	0.211	0.182	0.057	112.500	112.000	109.500	109.500	105.500	91.000	28.500	95.500	30.190	112.500	28.500
U101	98	LAB B	2,4-Dimethyl phenol	0.200		0.2217	0.2001	0.1987	0.1911	0.1890	0.1882	0.1867	110.850	100.050	99.350	95.550	94.500	94.100	93.350	98.107	6.003	110.850	93.350
U101	98	LAB C	2,4-Dimethyl phenol	0.200	0.000	0.347	0.000	0.000	0.000	0.000	0.000	0.000	173.500	0.000	0.000	0.000	0.000	0.000	0.000	24.786	65.712	173.500	0.000
U101	98	LAB D	2,4-Dimethyl phenol	0.200		0.363	0.371	0.369	0.335	0.322	0.281	0.273	181.500	185.500	184.500	167.500	161.000	140.500	136.500	165.357	21.064	181.500	136.500
U101	98	LAB E	2,4-Dimethyl phenol	0.200	0.000	0.160	0.155	0.151	0.150	0.149	0.146	0.145	80.000	77.500	75.500	75.000	74.500	73.000	72.500	75.429	2.412	80.000	72.500
U101	98	LAB F	2,4-Dimethyl phenol	0.200	0.005	0.212	0.200	0.199	0.193	0.188	0.185	0.171	80.000	76.472	75.001	72.830	70.180	69.011	64.520	72.601	4.609	80.000	64.520
P048	101	LAB A	2,4-Dinitrophenol	100.000	0.000	62.148	33.835	14.842	13.631	12.574	12.560	1.024	62.148	33.835	14.842	13.631	12.574	12.560	1.024	21.517	19.857	62.148	1.024
P048	101	LAB B	2,4-Dinitrophenol	100.000		1.7003	1.5166	1.0067	0.7334	0.6115	0.4640	0.3487	1.700	1.516	1.007	0.733	0.612	0.466	0.349	0.933	0.502	1.700	0.349
P048	101	LAB C	2,4-Dinitrophenol	100.000	0.000	17.176	16.076	9.653	9.173	6.520	3.939	1.030	17.176	16.076	9.653	9.173	6.520	3.939	1.030	9.081	6.343	17.176	1.030
P048	101	LAB D	2,4-Dinitrophenol	100.000		3.857	3.869	3.707	2.619	2.200	1.671	1.371	3.857	3.869	3.707	2.619	2.200	1.671	1.371	2.766	1.027	3.857	1.371
P048	101	LAB E	2,4-Dinitrophenol	100.000	0.000	23.620	16.796	14.666	13.629	12.642	11.616	10.626	23.620	16.796	14.666	13.629	12.642	11.616	10.626	14.817	4.666	23.620	10.626
P048	101	LAB F	2,4-Dinitrophenol	100.000		1.896	1.184	0.962	0.843	0.823	0.703	0.679	1.896	1.184	0.962	0.843	0.823	0.703	0.679	0.999	0.350	1.896	0.679
U105	102	LAB A	2,4-Dinitrotoluene	20.000	0.000	15.007	14.898	8.607	8.060	7.834	7.340	3.307	75.035	74.490	43.035	40.300	39.170	36.700	16.535	46.468	19.624	75.035	16.535
U105	102	LAB B	2,4-Dinitrotoluene	20.000		18.0662	15.4273	14.5580	14.3684	13.2633	11.1400	8.2204	90.331	77.137	72.790	71.842	66.317	55.700	41.102	67.883	14.616	90.331	41.102
U105	102	LAB C	2,4-Dinitrotoluene	20.000	0.000	19.772	19.121	18.948	18.699	15.750	13.732	5.111	98.860	95.605	94.740	93.495	78.750	68.660	25.555	79.381	24.173	98.860	25.555
U105	102	LAB D	2,4-Dinitrotoluene	20.000		9.737	9.040	8.929	8.889	8.225	7.897	7.679	48.685	45.200	44.645	44.445	41.125	39.485	38.395	43.200	3.169	48.685	38.395
U105	102	LAB E	2,4-Dinitrotoluene	20.000	0.000	21.800	20.801	20.261	17.934	17.874	17.577	15.412	109.000	104.005	101.305	89.670	89.370	87.885	77.060	94.171	10.431	109.000	77.060
U105	102	LAB F	2,4-Dinitrotoluene	20.000		18.414	18.058	17.290	17.030	16.970	16.680	15.570	92.070	90.290	86.450	85.150	84.850	83.400	77.850	85.727	4.384	92.070	77.850
U106	103	LAB A	2,6-Dinitrotoluene	2.000	0.000	2.202	2.007	1.999	1.912	1.740	1.702	0.744	110.100	100.350	99.950	95.600	87.000	85.100	37.200	87.900	22.141	110.100	37.200
U106	103	LAB B	2,6-Dinitrotoluene	2.000		1.7849	1.6695	1.6195	1.4460	1.3983	1.3881	1.1330	89.245	83.475	80.975	72.300	69.915	69.405	56.650	74.571	10.980	89.245	56.650
U106	103	LAB C	2,6-Dinitrotoluene	2.000	0.000	2.549	2.449	2.272	2.199	2.090	2.011	1.997	127.450	122.450	113.600	109.950	104.500	100.550	99.850	111.193	9.893	127.450	99.850
U106	103	LAB D	2,6-Dinitrotoluene	2.000		1.930	1.880	1.826	1.642	1.628	1.609	1.540	96.500	94.000	91.300	82.100	81.400	80.450	77.000	86.220	7.086	96.500	77.000
U106	103	LAB E	2,6-Dinitrotoluene	2.000	0.000	2.300	2.314	2.264	2.189	1.947	1.917	1.818	112.774	110.200	107.912	104.184	92.003	91.373	88.000	100.844	9.849	112.774	88.659
U106	103	LAB F	2,6-Dinitrotoluene	2.000	0.151	1.895	1.861	1.850	1.773	1.759	1.747	1.700	87.034	86.510	85.997	83.427	81.770	81.210	79.312	83.586	2.911	87.034	79.312
U047	77	LAB A	2-Chloronaphthalene	2.000	0.000	1.764	1.710	1.697	1.624	1.535	1.503	0.679	88.200	85.500	84.850	81.200	76.750	75.150	33.950	75.129	17.390	88.200	33.950
U047	77	LAB B	2-Chloronaphthalene	2.000		1.9108	1.7547	1.5289	1.5216	1.5037	1.4949	1.4111	95.540	87.735	76.445	76.080	75.185	74.745	70.555	79.469	8.171	95.540	70.555
U047	77	LAB C	2-Chloronaphthalene	2.000	0.000	2.553	2.507	2.491	2.483	2.463	2.413	1.501	127.650	125.350	124.550	124.150	123.150	120.650	75.050	117.221	17.325	127.650	75.050
U047	77	LAB D	2-Chloronaphthalene	2.000		2.206	2.273	2.268	2.195	2.078	1.906	1.670	110.300	113.650	113.400	109.750	103.900	95.300	83.500	104.071	9.846	113.650	83.500
U047	77	LAB E	2-Chloronaphthalene	2.000	0.000	2.105	1.885	1.879	1.841	1.807	1.779	1.674	105.250	94.250	93.950	92.050	90.350	88.950	83.700	92.643	6.123	105.250	83.700
U047	77	LAB F	2-Chloronaphthalene	2.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U048	78	LAB A	2-Chlorophenol	0.200	0.000	0.264	0.238	0.133	0.107	0.000	0.000	0.000	132.000	119.000	66.500	53.500	0.000	0.000	0.000	53.071	52.471	132.000	0.000
U048	78	LAB B	2-Chlorophenol	0.200		0.2554	0.2445	0.2424	0.2320	0.2100	0.2088	0.2082	127.700	122.250	121.200	116.000	105.000	104.400	104.100	114.379	9.118	127.700	104.100
U048	78	LAB C	2-Chlorophenol	0.200	0.000	0.365	0.365	0.304	0.287	0.284	0.265	0.257	182.500	182.500	152.000	143.500	142.000	132.500	128.500	147.643	19.465	182.500	128.500
U048	78	LAB D	2-Chlorophenol	0.200		0.217	0.217	0.211	0.210	0.201	0.194	0.179	108.500	108.500	105.500	105.000	100.500	97.000	89.500	102.071	6.420	108.500	89.500
U048	78	LAB E	2-Chlorophenol	0.200	0.000	0.246	0.231	0.226	0.213	0.208	0.207	0.207	123.000	115.500	113.000	106.500	104.000	103.500	103.500	109.857	6.976	123.000	103.500
U048	78	LAB F	2-Chlorophenol	0.200		0.269	0.254	0.240	0.234	0.227	0.222	0.212	134.500	127.000	120.000	117.000	113.500	111.000	106.000	118.429	9.968	134.500	106.000
U168	124	LAB A	2-Naphthylamine	100.000	0.000	12.050	12.132	11.986	10.856	5.740	4.125	3.076	12.050	12.132	11.986	10.856	5.740	4.125	3.076	8.566	3.700	12.132	3.076
U168	124	LAB B	2-Naphthylamine	100.000		210.0440	169.0510	137.9650	97.5660	91.2976	88.6646	84.8563	210.044	169.051	137.965	97.566	91.298	88.665	84.856	125.478	44.650	210.044	84.856
U168	124	LAB C	2-Naphthylamine	100.000	0.000	29.994	27.743	20.808	20.107	16.433	11.883	4.976	29.994	27.743	20.808	20.107	16.433	11.883	4.976	18.731	7.889	29.994	4.976
U168	124	LAB D	2-Naphthylamine	100.000		7.500	6.130	3.873	3.748	3.512	2.016	1.107	7.500	6.130	3.873	3.748	3.512	2.016	1.107	3.984	2.049	7.500	1.107

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP 1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP 1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
U168	124	LAB E	2-Naphthylamine	100.000	0.000	0.874	0.271	0.203	0.107	0.000	0.558	7.001	0.874	0.271	0.203	0.107	0.000	0.558	7.001	0.003	0.032	0.874	7.001
U168	124	LAB F	2-Naphthylamine	100.000		4.415	3.400	3.472	2.033	2.072	2.526	2.002	4.415	3.400	3.472	2.033	2.072	2.526	2.002	3.004	0.717	4.415	2.002
U191	143	LAB A	2-Picoline	10.000	0.000	0.096	0.551	0.274	4.767	4.400	3.350	1.000	60.960	55.510	62.740	47.670	44.000	33.500	10.000	48.031	14.227	65.000	10.000
U191	143	LAB B	2-Picoline	10.000		14.0003	14.1400	12.0773	11.0767	10.1131	0.0072	5.3000	140.003	141.400	120.773	110.767	101.131	95.072	53.000	100.222	33.032	140.003	53.003
U191	143	LAB C	2-Picoline	10.000	0.000	0.743	0.000	4.044	3.004	3.703	0.000	0.000	97.430	50.000	40.440	30.040	37.030	0.000	0.000	30.543	30.074	97.430	0.000
U191	143	LAB D	2-Picoline	10.000		3.248	2.700	2.000	2.016	2.374	1.032	0.021	32.480	27.000	20.000	20.160	23.740	19.320	0.210	23.070	7.700	32.460	0.210
U191	143	LAB E	2-Picoline	10.000	0.000	0.124	0.124	0.120	0.120	0.112	0.100	0.003	1.240	1.240	1.200	1.200	1.120	1.000	0.000	1.140	0.102	1.240	0.000
U191	143	LAB F	2-Picoline	10.000		0.100	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.270	0.001	1.000	0.000
P020	73	LAB A	2-sec-Butyl-4,6-dinitrophenol	100.000	0.000	10.020	17.087	6.000	0.000	0.018	7.006	2.414	10.020	17.087	6.000	0.000	0.012	7.000	2.414	10.186	5.274	10.020	2.414
P020	73	LAB B	2-sec-Butyl-4,6-dinitrophenol	100.000		20.2077	10.2414	13.1701	11.2040	9.0541	7.0302	7.0312	20.200	10.241	13.170	11.204	9.054	7.050	7.031	12.700	4.723	20.200	7.031
P020	73	LAB C	2-sec-Butyl-4,6-dinitrophenol	100.000	0.000	104.570	100.520	95.310	94.275	74.507	60.604	43.370	104.570	100.520	95.310	94.275	74.507	60.504	43.370	91.305	35.183	104.570	43.370
P020	73	LAB D	2-sec-Butyl-4,6-dinitrophenol	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P020	73	LAB E	2-sec-Butyl-4,6-dinitrophenol	100.000	0.000	77.736	72.702	72.000	70.051	62.052	60.291	40.000	77.736	72.702	72.000	70.051	62.052	60.291	40.000	65.202	9.110	77.736	40.000
P020	73	LAB F	2-sec-Butyl-4,6-dinitrophenol	100.000		14.436	11.843	11.477	10.903	13.012	7.313	0.000	14.436	11.843	11.477	10.903	10.012	7.313	0.000	9.307	4.300	14.436	0.000
U073	88	LAB A	3,3'-Dichlorobenzidine	100.000	0.000	47.072	30.870	34.001	31.036	29.736	20.400	14.054	47.072	30.870	34.001	31.036	29.736	20.400	14.054	32.003	9.483	47.072	14.054
U073	88	LAB B	3,3'-Dichlorobenzidine	100.000		100.7100	161.1500	111.0650	107.0540	106.0300	105.4360	102.7540	100.710	161.150	111.065	107.054	106.030	105.436	102.754	124.670	30.401	100.710	102.754
U073	88	LAB C	3,3'-Dichlorobenzidine	100.000	0.000	51.000	32.700	32.332	27.670	27.000	20.410	25.000	51.000	32.700	32.332	27.670	27.000	20.410	25.000	32.932	8.300	51.000	25.000
U073	88	LAB D	3,3'-Dichlorobenzidine	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U073	88	LAB E	3,3'-Dichlorobenzidine	100.000	0.000	141.071	141.350	137.584	130.113	79.091	74.100	72.944	141.071	141.350	137.584	130.113	79.091	74.100	72.944	111.033	31.571	141.071	72.944
U073	88	LAB F	3,3'-Dichlorobenzidine	100.000		50.201	56.290	30.987	26.558	22.172	21.001	21.165	50.201	56.290	30.987	26.558	22.172	21.001	21.165	33.701	14.923	59.201	21.165
U091	93	LAB A	3,3'-Dimethoxybenzidine	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U091	93	LAB B	3,3'-Dimethoxybenzidine	500.000		604.1470	100.3560	170.0020	90.0000	70.0010	70.1740	65.0510	120.830	36.071	35.770	17.012	14.172	14.035	13.012	35.030	35.085	120.830	13.012
U091	93	LAB C	3,3'-Dimethoxybenzidine	500.000	0.000	54.050	40.010	36.297	30.015	21.430	10.774	13.150	10.012	8.322	7.250	6.103	4.286	3.700	2.030	6.321	2.700	10.012	2.030
U091	93	LAB D	3,3'-Dimethoxybenzidine	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U091	93	LAB E	3,3'-Dimethoxybenzidine	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U091	93	LAB F	3,3'-Dimethoxybenzidine	500.000		97.004	10.042	0.166	4.186	4.000	0.000	0.000	19.593	2.008	1.233	0.837	0.012	0.000	0.000	3.450	6.003	19.593	0.000
U095	95	LAB A	3,3'-Dimethylbenzidine	100.000	0.000	3.302	3.022	2.944	2.663	2.150	2.100	1.071	3.302	3.022	2.944	2.663	2.150	2.100	1.071	2.520	0.536	3.302	1.071
U095	95	LAB B	3,3'-Dimethylbenzidine	100.000		3.1049	2.0402	2.1301	1.0341	0.0000	0.0493	0.5227	3.105	2.040	2.130	1.034	0.000	0.049	0.523	1.761	0.943	3.105	0.523
U095	95	LAB C	3,3'-Dimethylbenzidine	100.000	0.000	12.940	0.410	6.507	5.260	5.250	5.151	3.071	12.940	0.410	6.507	5.260	5.250	5.151	3.071	6.261	2.770	12.940	3.071
U095	95	LAB D	3,3'-Dimethylbenzidine	100.000		1.340	0.000	0.740	0.725	0.551	0.120	0.030	1.340	0.000	0.740	0.725	0.551	0.120	0.030	0.621	0.406	1.340	0.030
U095	95	LAB E	3,3'-Dimethylbenzidine	100.000	0.400	56.040	56.550	50.057	40.207	27.401	20.210	22.000	56.010	56.220	50.452	40.090	27.390	20.100	22.707	41.100	14.157	56.010	22.707
U095	95	LAB F	3,3'-Dimethylbenzidine	100.000		1.410	1.343	0.012	0.713	0.004	0.000	0.000	1.410	1.343	0.012	0.713	0.004	0.000	0.000	0.707	0.524	1.410	0.000
P027	78	LAB A	3-Chloropropionitrile	100.000	0.000	43.080	30.270	30.150	35.145	29.107	24.010	10.501	43.000	30.270	30.150	35.145	29.107	24.010	10.501	30.700	9.023	43.000	10.501
P027	78	LAB B	3-Chloropropionitrile	100.000		40.0164	34.0023	34.2030	33.1443	24.4700	10.0274	12.2190	40.010	34.002	34.203	33.144	24.470	10.027	12.220	27.042	8.712	40.010	12.220
P027	78	LAB C	3-Chloropropionitrile	100.000	0.000	110.000	113.507	112.455	91.736	0.000	0.000	0.000	110.000	113.507	112.455	91.736	0.000	0.000	0.000	62.512	54.725	110.000	0.000
P027	78	LAB D	3-Chloropropionitrile	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P027	78	LAB E	3-Chloropropionitrile	100.000	0.000	71.020	67.733	65.014	63.900	63.324	60.030	62.200	71.020	67.733	65.014	63.965	63.324	60.030	62.200	63.327	5.023	71.020	67.200
P027	78	LAB F	3-Chloropropionitrile	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U157	119	LAB A	3-Methylcholanthrene	100.000	0.000	16.597	16.220	15.020	10.882	10.123	9.757	3.642	16.597	16.220	15.020	10.882	10.123	9.757	3.642	11.000	4.402	16.597	3.642
U157	119	LAB B	3-Methylcholanthrene	100.000		24.5032	21.4573	10.7900	10.2500	14.0000	13.0372	0.2010	24.503	21.457	10.791	10.250	14.067	13.037	0.200	17.311	5.140	24.503	0.202
U157	119	LAB C	3-Methylcholanthrene	100.000	0.000	30.003	23.441	22.407	20.004	17.380	13.221	6.640	30.003	23.441	22.407	20.004	17.380	13.221	6.640	19.541	6.610	30.003	6.640
U157	119	LAB D	3-Methylcholanthrene	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U157	119	LAB E	3-Methylcholanthrene	100.000	0.000	16.100	15.041	15.352	14.476	13.041	12.710	7.003	16.100	15.041	15.352	14.476	13.041	12.710	7.003	13.047	2.834	16.100	7.003
U157	119	LAB F	3-Methylcholanthrene	100.000		10.085	9.007	7.357	6.700	6.524	6.428	5.050	10.085	9.007	7.357	6.700	6.524	6.428	5.050	7.421	1.302	10.085	5.050
U158	120	LAB A	4,4'-Methylenebis(2-chloroaniline)	20.000	0.000	14.731	14.262	9.410	7.712	7.556	7.015	4.271	73.655	71.310	47.095	38.560	37.778	35.075	21.355	46.404	17.049	73.655	21.350
U158	120	LAB B	4,4'-Methylenebis(2-chloroaniline)	20.000		11.0074	7.2602	5.4033	4.0500	4.3370	3.3600	1.4316	55.037	36.320	27.407	24.300	21.680	16.840	7.150	27.403	16.031	55.037	7.150
U158	120	LAB C	4,4'-Methylenebis(2-chloroaniline)	20.000	0.000	13.717	10.724	10.480	10.332	9.011	8.433	2.210	68.585	53.620	52.400	51.660	45.055	42.165	11.000	45.500	17.183	68.585	11.000
U158	120	LAB D	4,4'-Methylenebis(2-chloroaniline)	20.000		12.100	8.040	6.100	5.517	5.308	5.190	3.024	60.520	40.225	30.045	27.585	26.525	25.055	10.020	33.000	12.594	60.520	10.020
U158	120	LAB E	4,4'-Methylenebis(2-chloroaniline)	20.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U158	120	LAB F	4,4'-Methylenebis(2-chloroaniline)	20.000		17.045	13.706	10.970	10.270	8.250	8.220	7.340	85.225	68.525	54.085	51.385	41.250	41.100	36.740	54.047	17.011	85.225	36.740
P047	100	LAB A	4,6-Dinitro-o-cresol and salts	100.000	0.000	10.544	10.003	10.020	10.340	7.552	1.906	0.705	10.544	10.003	10.020	10.340	7.552	1.905	0.705	11.711	7.566	19.544	0.705
P047	100	LAB B	4,6-Dinitro-o-cresol and salts	100.000		43.5717	42.4930	32.7600	32.5100	19.0020	17.7222	11.0263	43.572	42.494	32.770	32.520	19.002	17.722	11.026	20.457	11.756	43.572	11.026
P047	100	LAB C	4,6-Dinitro-o-cresol and salts	100.000	0.000	73.673	33.260	31.330	24.002	15.765	10.604	0.000	73.673	33.260	31.330	24.002	15.765	10.604	0.000	27.073	21.026	73.673	0.000
P047	100	LAB D	4,6-Dinitro-o-cresol and salts	100.000		5.715	3.230	2.772	2.127	1.022	1.444	1.258	5.715	3.230	2.772	2.127	1.022	1.444	1.258	2.807	1.437	5.715	1.258
P047	100	LAB E	4,6-Dinitro-o-cresol and salts	100.000	0.000	27.482	24.000	22.418	18.000	3.041	3.015	1.189	27.482	24.000	22.418	18.000	3.041	3.015	1.189	14.372	10.330	27.482	1.189
P047	100	LAB F	4,6-Dinitro-o-cresol and salts	100.000		7.393	6.401	6.208	6.166	6.513	2.570	0.000	7.393	6.401	6.208	6.166	6.513	2.570	0.000	4.010	2.449	7.393	0.000

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
	55	LAB A	4-Aminobiphenyl	100.000	0.000	15.877	14.712	14.066	14.013	14.017	13.083	0.000	15.877	14.712	14.066	14.013	14.017	13.083	0.000	13.081	2.814	15.877	0.000
	55	LAB B	4-Aminobiphenyl	100.000		591.2140	580.3400	549.0010	487.0180	485.1220	382.1200	307.4170	591.214	580.340	549.001	487.018	485.122	382.120	307.417	473.487	109.400	591.214	307.417
	55	LAB C	4-Aminobiphenyl	100.000	0.000	44.257	41.466	40.195	36.753	35.251	29.119	19.013	44.257	41.466	40.195	36.753	35.251	29.119	19.013	35.081	7.921	44.257	19.013
	55	LAB D	4-Aminobiphenyl	100.000		11.832	0.000	0.000	0.000	0.000	0.000	0.000	11.832	0.000	0.000	0.000	0.000	0.000	0.000	1.690	4.140	11.832	0.000
	55	LAB E	4-Aminobiphenyl	100.000	0.017	34.694	33.929	32.290	32.029	30.068	29.074	27.432	34.686	33.923	32.283	32.024	30.061	29.066	27.427	31.641	2.293	34.686	27.427
	55	LAB F	4-Aminobiphenyl	100.000		26.421	18.256	18.073	17.370	16.060	14.707	11.926	26.421	18.256	18.073	17.370	16.060	14.707	11.926	17.547	4.176	26.421	11.926
U030	71	LAB A	4-Bromophenyl phenyl ether	0.400	0.000	0.455	0.437	0.386	0.375	0.348	0.347	0.134	113.750	109.250	96.500	93.750	87.000	86.750	33.500	88.643	24.455	113.750	33.500
U030	71	LAB B	4-Bromophenyl phenyl ether	0.400		0.5829	0.4674	0.4402	0.4364	0.3855	0.3786	0.3736	145.725	116.850	110.050	109.100	96.375	94.650	93.400	110.421	17.129	145.725	93.400
U030	71	LAB C	4-Bromophenyl phenyl ether	0.400	0.000	0.736	0.367	0.347	0.339	0.337	0.297	0.290	184.000	91.750	86.750	84.750	84.250	74.250	72.500	96.893	38.119	184.000	72.500
U030	71	LAB D	4-Bromophenyl phenyl ether	0.400		0.436	0.425	0.400	0.385	0.380	0.380	0.367	109.000	106.250	100.000	96.250	95.000	95.000	91.750	98.107	6.040	109.000	91.750
U030	71	LAB E	4-Bromophenyl phenyl ether	0.400	0.000	0.480	0.464	0.459	0.459	0.398	0.388	0.365	120.000	116.000	114.750	114.750	99.500	97.000	91.250	107.607	12.223	120.000	91.250
U030	71	LAB F	4-Bromophenyl phenyl ether	0.400		0.300	0.289	0.281	0.281	0.273	0.270	0.265	75.000	72.250	70.250	70.250	68.250	67.500	66.250	70.179	3.170	75.000	66.250
U170	127	LAB A	4-Nitrophenol	25.000	0.000	58.776	34.497	10.007	9.321	8.618	8.348	0.000	235.104	137.988	40.028	37.284	34.472	33.392	0.000	74.038	78.784	235.104	0.000
U170	127	LAB B	4-Nitrophenol	25.000		12.9621	9.5790	7.0250	6.6330	4.4460	3.1631	2.4367	51.848	38.316	28.100	26.532	17.784	12.652	9.747	26.424	13.962	51.848	9.747
U170	127	LAB C	4-Nitrophenol	25.000	0.000	30.881	24.165	15.190	15.130	13.007	11.154	6.008	123.524	96.660	60.760	60.520	52.028	44.616	24.032	66.020	30.863	123.524	24.032
U170	127	LAB D	4-Nitrophenol	25.000		14.136	12.183	10.852	10.017	7.645	6.509	6.476	56.544	48.732	43.408	40.068	30.580	26.036	25.904	38.753	10.989	56.544	25.904
U170	127	LAB E	4-Nitrophenol	25.000	0.087	21.440	20.281	18.196	18.081	17.604	16.196	15.223	85.400	80.751	72.140	71.720	70.041	64.834	60.544	72.310	7.841	85.400	60.544
U170	127	LAB F	4-Nitrophenol	25.000		1.649	1.624	1.610	1.585	1.483	1.325	0.784	6.596	6.496	6.440	6.340	5.932	5.300	3.136	5.749	1.149	6.596	3.136
U181	135	LAB A	5-Nitro-o-toluidine	40.000	0.000	41.703	39.729	38.702	38.490	34.557	24.434	19.903	104.258	99.323	96.756	96.225	86.393	61.085	49.758	84.840	19.486	104.258	49.758
U181	135	LAB B	5-Nitro-o-toluidine	40.000		7.7368	7.0720	6.7114	6.6864	4.2429	3.8867	3.4156	19.342	17.680	16.779	16.716	10.606	9.717	8.539	14.107	4.069	19.342	8.539
U181	135	LAB C	5-Nitro-o-toluidine	40.000	0.000	32.977	21.285	6.646	5.404	4.928	4.200	3.730	82.443	53.213	16.615	13.510	12.320	10.500	9.325	28.316	26.287	82.443	9.325
U181	135	LAB D	5-Nitro-o-toluidine	40.000		50.519	42.032	33.344	27.553	4.138	3.057	2.162	126.298	105.080	83.360	68.883	10.345	7.643	5.405	58.158	48.614	126.298	5.405
U181	135	LAB E	5-Nitro-o-toluidine	40.000	0.040	270.363	36.425	33.396	30.441	29.313	28.309	26.299	661.002	90.929	82.160	74.960	72.126	69.050	64.710	145.081	170.389	661.002	64.710
U181	135	LAB F	5-Nitro-o-toluidine	40.000		32.636	28.851	28.556	26.984	26.500	22.160	21.160	81.590	72.128	71.390	67.460	66.250	55.400	52.900	66.731	9.451	81.590	52.900
	51	LAB A	Acenaphthalene	4.000	0.000	4.271	4.213	4.073	3.857	3.819	3.606	1.650	106.775	105.325	101.825	96.425	95.475	90.150	41.250	91.036	21.832	106.775	41.250
	51	LAB B	Acenaphthalene	4.000		3.7563	3.4960	3.4520	3.4085	3.3444	3.2634	3.1613	93.908	87.400	86.300	85.213	83.610	81.585	79.033	85.292	4.271	93.908	79.033
	51	LAB C	Acenaphthalene	4.000	0.000	4.534	4.484	4.476	4.457	4.304	4.273	4.160	113.350	112.100	111.900	111.425	107.600	106.825	104.000	109.739	3.585	113.350	104.000
	51	LAB D	Acenaphthalene	4.000		4.254	4.135	4.099	4.012	3.999	3.957	3.937	106.350	103.375	102.475	100.300	99.975	98.925	98.425	101.254	2.799	106.350	98.425
	51	LAB E	Acenaphthalene	4.000	0.000	3.604	3.441	3.420	3.331	3.277	3.162	2.920	90.107	86.037	84.541	83.135	80.704	77.712	73.016	82.816	4.661	90.107	73.016
	51	LAB F	Acenaphthalene	4.000	0.031	3.431	3.249	2.989	2.885	2.886	2.860	0.000	85.115	80.000	74.100	71.621	69.600	68.405	0.000	63.922	25.707	85.115	0.000
	52	LAB A	Acenapthene	0.400	0.000	0.642	0.580	0.301	0.294	0.267	0.122	0.028	160.500	145.000	75.250	73.500	66.750	30.500	7.000	69.214	57.269	160.500	7.000
	52	LAB B	Acenapthene	0.400		0.4230	0.3991	0.3968	0.3891	0.3674	0.3663	0.3494	105.750	99.775	99.200	97.275	91.850	91.575	87.350	95.111	5.708	105.750	87.350
	52	LAB C	Acenapthene	0.400	0.000	0.606	0.534	0.527	0.502	0.500	0.476	0.443	151.500	133.500	131.750	125.500	125.000	119.000	110.750	129.214	11.949	151.500	110.750
	52	LAB D	Acenapthene	0.400		0.525	0.524	0.501	0.497	0.489	0.474	0.449	131.250	131.000	125.250	124.250	122.250	118.500	112.250	123.536	6.245	131.250	112.250
	52	LAB E	Acenapthene	0.400	0.000	0.438	0.431	0.416	0.405	0.404	0.390	0.380	109.500	107.750	104.000	101.250	101.000	97.500	95.000	102.357	4.768	109.500	95.000
	52	LAB F	Acenapthene	0.400		0.365	0.360	0.358	0.335	0.333	0.331	0.285	91.250	90.000	89.500	83.750	83.250	82.750	71.250	84.536	6.456	91.250	71.250
U004	53	LAB A	Acetophenone	10.000	0.000	7.630	7.551	6.630	6.300	6.242	5.819	2.820	76.300	75.510	66.300	63.000	62.420	58.190	28.200	61.866	14.660	76.300	28.200
U004	53	LAB B	Acetophenone	10.000		8.9740	8.8931	8.4012	8.4670	6.3500	4.8333	4.7000	89.740	88.931	84.012	84.670	63.500	48.333	47.000	64.101	18.000	89.740	47.000
U004	53	LAB C	Acetophenone	10.000	0.000	21.000	9.340	8.850	8.606	8.422	8.340	7.033	210.000	93.400	88.500	86.060	84.220	83.400	70.330	102.237	46.940	210.000	70.330
U004	53	LAB D	Acetophenone	10.000		9.611	9.240	9.100	9.037	9.019	8.867	8.844	96.110	92.400	91.000	90.370	90.190	88.670	88.440	90.464	2.661	96.110	88.440
U004	53	LAB E	Acetophenone	10.000	0.000	7.843	7.821	7.500	7.230	7.162	7.155	6.204	78.432	78.210	75.000	72.301	71.616	71.548	62.042	72.736	5.330	78.432	62.042
U004	53	LAB F	Acetophenone	10.000		8.525	7.762	7.501	6.613	6.483	6.130	0.321	85.250	77.620	75.010	66.130	64.830	61.300	3.210	61.907	26.256	85.250	3.210
U012	56	LAB A	Aniline	20.000	0.000	2.348	1.922	1.813	1.701	1.582	1.530	1.025	11.740	9.610	9.066	8.505	7.910	7.650	5.125	8.521	1.969	11.740	5.125
U012	56	LAB B	Aniline	20.000		4.3262	3.5407	2.8062	2.1711	2.1100	2.0058	1.7900	21.631	17.704	14.031	10.856	10.550	10.029	8.950	13.400	4.382	21.631	8.950
U012	56	LAB C	Aniline	20.000	0.000	8.042	6.926	6.345	6.342	6.069	4.058	2.821	40.210	34.630	31.720	31.710	30.345	20.290	14.095	29.048	9.430	40.210	14.095
U012	56	LAB D	Aniline	20.000		0.924	0.551	0.387	0.368	0.352	0.349	0.000	4.620	2.750	1.935	1.840	1.760	1.745	0.000	2.095	1.209	4.620	0.000
U012	56	LAB E	Aniline	20.000	0.000	2.895	2.682	1.636	1.579	1.508	1.447	1.405	14.475	13.410	8.180	7.895	7.540	7.235	7.025	9.394	2.919	14.475	7.025
U012	56	LAB F	Aniline	20.000		3.540	2.975	2.832	2.717	2.681	2.630	2.630	17.700	14.875	14.160	13.585	13.405	13.150	13.150	14.300	1.633	17.700	13.150
	57	LAB A	Anthracene	10.000	0.000	7.561	7.300	7.050	6.953	6.890	6.443	3.430	75.610	73.000	70.500	69.530	68.900	64.430	34.300	65.181	13.066	75.610	34.300
	57	LAB B	Anthracene	10.000		8.7665	8.5436	7.4609	6.9641	6.9251	6.6083	6.0234	87.665	85.436	74.609	69.641	69.251	66.083	60.234	72.543	10.320	87.665	60.234
	57	LAB C	Anthracene	10.000	0.000	22.042	12.209	11.570	11.444	11.340	10.930	9.424	220.420	122.090	115.700	114.440	113.400	109.300	94.240	127.084	40.256	220.420	94.240
	57	LAB D	Anthracene	10.000		9.600	8.754	8.600	8.533	8.500	8.404	8.200	96.000	87.540	86.000	85.330	85.000	84.040	82.000	86.559	3.549	96.000	82.000
	57	LAB E	Anthracene	10.000	0.023	7.810	6.583	6.343	6.279	6.074	6.003	5.395	77.871	65.679	63.204	62.560	60.510	59.800	53.720	63.243	6.975	77.871	53.720
	57	LAB F	Anthracene	10.000		8.184	7.954	7.253	7.134	6.951	5.930	5.400	81.840	79.540	72.530	71.340	69.510	59.300	54.000	69.201	8.354	81.840	54.000
	58	LAB A	Aramite	500.000	0.000	32.227	31.533	29.650	28.510	27.305	25.507	16.048	6.445	6.307	5.930	5.702	5.461	5.101	3.210	5.478	1.012	6.445	3.210
	58	LAB B	Aramite	500.000		552.3570	550.2570	544.0580	484.7980	340.6930	272.0490	48.8240	110.471	110.051	108.812	96.960	68.139	54.410	9.765	79.227	36.199	110.471	9.765

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
NONVOLATILE ORGANICS																							
	60	LAB C	Aramite	500.000	0.000	716.350	711.100	571.100	570.270	550.160	548.660	541.140	143.270	142.220	114.220	114.054	110.032	109.732	108.228	120.251	14.310	143.270	108.228
	60	LAB D	Aramite	500.000		3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.700	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.265	0.700	0.000
	60	LAB E	Aramite	500.000	0.000	514.351	507.457	494.157	467.939	449.474	274.150	247.200	102.870	101.491	98.831	93.588	89.895	54.830	49.440	84.421	21.881	102.870	49.440
	60	LAB F	Aramite	500.000		2790.127	2573.750	1909.630	1659.242	1270.145	963.252	432.022	558.025	514.750	381.926	331.848	254.029	192.650	86.404	331.376	166.401	558.025	86.404
U018	59	LAB A	Benz(a)anthracene	100.000	0.000	44.484	42.510	36.664	35.384	34.575	31.043	13.010	44.484	42.510	36.664	35.384	34.575	31.043	13.010	33.953	9.383	44.484	13.010
U018	59	LAB B	Benz(a)anthracene	100.000		30.2574	29.0830	25.0027	16.2070	15.0875	14.0700	10.7490	30.257	29.083	25.003	16.207	15.088	14.070	10.749	20.065	7.580	30.257	10.749
U018	59	LAB C	Benz(a)anthracene	100.000	0.000	333.760	76.729	76.374	76.020	73.000	72.000	40.400	333.760	76.729	76.374	76.020	73.000	72.000	40.400	106.898	99.201	333.760	40.400
U018	59	LAB D	Benz(a)anthracene	100.000		173.215	114.177	90.022	76.077	76.149	70.521	55.500	173.215	114.177	90.022	76.077	76.149	70.521	55.500	93.666	38.706	173.215	55.500
U018	59	LAB E	Benz(a)anthracene	100.000	0.000	219.531	200.524	202.129	195.762	190.034	91.030	59.030	219.531	200.524	202.129	195.762	190.034	91.030	59.030	165.434	60.165	219.531	59.030
U018	59	LAB F	Benz(a)anthracene	100.000		361.760	316.447	301.155	225.575	201.723	189.130	115.030	361.760	316.447	301.155	225.575	201.723	189.130	115.030	244.403	76.216	361.760	115.030
	63	LAB A	Benzo(b)fluoranthene	100.000	0.000	50.250	47.400	43.200	36.247	32.200	30.000	15.010	50.250	47.400	43.200	36.247	32.200	30.000	15.010	36.330	10.997	50.250	15.010
	63	LAB B	Benzo(b)fluoranthene	100.000		42.5504	34.4030	30.7291	26.5036	24.4500	21.0024	13.7058	42.550	34.403	30.729	26.504	24.450	21.002	13.706	27.621	8.953	42.550	13.706
	63	LAB C	Benzo(b)fluoranthene	100.000	0.000	127.161	114.447	111.310	72.103	72.030	70.255	30.960	127.161	114.447	111.310	72.103	72.030	70.255	30.960	85.467	29.720	127.161	30.960
	63	LAB D	Benzo(b)fluoranthene	100.000		39.050	30.565	29.442	24.017	23.775	23.110	21.300	39.050	30.565	29.442	24.017	23.775	23.110	21.300	27.323	5.824	39.050	21.300
	63	LAB E	Benzo(b)fluoranthene	100.000	0.000	54.300	50.230	49.540	47.067	46.100	40.510	34.084	54.300	50.230	49.540	47.067	46.100	40.510	34.084	45.976	6.695	54.300	34.084
	63	LAB F	Benzo(b)fluoranthene	100.000		19.044	18.002	17.062	15.950	15.754	13.025	12.072	19.044	18.002	17.062	15.950	15.754	13.025	12.072	15.844	2.122	19.044	12.072
U024	67	LAB A	Bis(2-chloroethoxy)methane	8.000	0.000	4.003	3.800	3.304	3.340	3.304	2.555	1.340	50.038	47.500	41.300	41.750	41.300	31.938	16.750	38.701	10.442	50.038	16.750
U024	67	LAB B	Bis(2-chloroethoxy)methane	8.000		3.0412	2.8710	2.8308	2.7047	2.6301	2.6223	2.6152	38.015	35.888	35.385	33.809	32.876	32.779	32.690	34.492	1.930	38.015	32.690
U024	67	LAB C	Bis(2-chloroethoxy)methane	8.000	0.000	7.980	7.944	7.721	7.716	7.436	7.224	7.176	99.750	99.300	96.513	96.450	92.950	90.300	89.700	94.995	3.401	99.750	89.700
U024	67	LAB D	Bis(2-chloroethoxy)methane	8.000		4.550	4.264	4.213	4.169	4.043	3.960	3.931	56.875	53.300	52.663	52.113	50.538	49.500	49.138	52.018	2.497	56.875	49.138
U024	67	LAB E	Bis(2-chloroethoxy)methane	8.000	0.000	5.894	4.875	0.000	0.000	0.000	0.000	0.000	73.675	60.938	0.000	0.000	0.000	0.000	0.000	19.230	30.070	73.675	0.000
U024	67	LAB F	Bis(2-chloroethoxy)methane	8.000		4.249	4.185	4.160	3.924	3.697	3.312	3.006	53.113	52.313	52.000	49.050	46.213	41.400	37.575	47.381	5.837	53.113	37.575
U025	68	LAB A	Bis(2-chloroethyl)ether	4.000	0.000	1.804	1.492	1.443	1.270	0.925	0.509	0.000	45.100	37.300	36.075	31.750	23.125	12.725	0.000	26.582	14.556	45.100	0.000
U025	68	LAB B	Bis(2-chloroethyl)ether	4.000		4.3262	3.5587	2.8062	2.1711	2.1109	2.0052	1.7880	108.155	88.968	70.155	54.278	52.773	50.130	44.700	67.031	21.011	108.155	44.700
U025	68	LAB C	Bis(2-chloroethyl)ether	4.000		18.675	11.647	8.087	5.602	4.717	3.732	3.510	466.875	291.175	202.175	140.050	117.925	93.300	87.750	199.893	130.503	466.875	87.750
U025	68	LAB D	Bis(2-chloroethyl)ether	4.000		4.091	3.846	3.789	3.744	3.703	3.620	3.379	102.275	96.150	94.725	93.600	92.575	90.500	84.475	93.471	5.525	102.275	84.475
U025	68	LAB E	Bis(2-chloroethyl)ether	4.000	0.000	3.262	2.994	2.884	2.843	2.823	2.775	2.633	81.550	74.850	72.100	71.075	70.575	69.375	65.825	72.207	4.881	81.550	65.825
U025	68	LAB F	Bis(2-chloroethyl)ether	4.000		4.474	3.577	3.505	3.350	3.325	2.939	2.345	111.850	89.425	87.625	83.750	83.125	73.475	58.625	83.982	14.904	111.850	58.625
U027	69	LAB A	Bis(2-chloroisopropyl)ether	4.000	0.000	1.600	1.500	1.368	1.346	1.211	1.197	0.588	40.000	37.500	34.200	33.650	30.275	29.925	14.700	31.314	7.972	40.000	14.700
U027	69	LAB B	Bis(2-chloroisopropyl)ether	4.000		2.3940	2.2840	2.1421	2.0203	1.9509	1.8007	1.7509	59.850	57.100	53.553	50.508	48.773	45.018	43.773	51.225	6.230	59.850	43.773
U027	69	LAB C	Bis(2-chloroisopropyl)ether	4.000	0.000	6.932	6.612	6.562	6.467	6.190	5.432	2.974	173.300	165.300	164.050	161.675	154.750	135.800	74.350	147.032	31.614	173.300	74.350
U027	69	LAB D	Bis(2-chloroisopropyl)ether	4.000		4.033	3.861	3.830	3.764	3.664	3.534	3.442	100.825	96.525	95.750	94.100	91.600	88.350	86.050	93.314	4.966	100.825	86.050
U027	69	LAB E	Bis(2-chloroisopropyl)ether	4.000	0.000	4.407	4.392	4.281	4.111	3.961	3.722	3.375	110.175	109.800	107.025	102.775	99.025	93.050	84.375	101.746	8.905	110.175	84.375
U027	69	LAB F	Bis(2-chloroisopropyl)ether	4.000		6.164	5.764	5.514	5.274	4.812	3.241	2.874	154.100	144.100	137.850	131.850	120.300	81.025	71.850	120.154	29.518	154.100	71.850
	70	LAB A	Bis(2-ethylhexyl)phthalate	2.000	0.700	4.472	4.422	4.421	4.282	3.904	3.126	1.885	189.771	187.886	187.040	182.993	129.403	111.047	57.342	132.207	24.970	189.771	57.342
	70	LAB B	Bis(2-ethylhexyl)phthalate	2.000		9.9884	9.5540	9.6494	8.3501	4.8148	3.3168	0.6092	499.420	477.700	482.470	417.505	240.740	165.840	30.460	327.162	187.640	499.420	30.460
	70	LAB C	Bis(2-ethylhexyl)phthalate	2.000	1.170	5.711	2.018	1.247	1.021	0.948	0.621	0.621	211.703	63.407	38.330	32.200	20.905	20.054	25.000	61.846	62.372	211.703	20.054
	70	LAB D	Bis(2-ethylhexyl)phthalate	2.000		6.683	5.802	5.807	5.703	4.920	4.871	4.174	334.150	290.100	290.350	285.150	246.000	243.550	208.700	272.290	39.813	334.150	208.700
	70	LAB E	Bis(2-ethylhexyl)phthalate	2.000	0.772	6.241	6.003	5.490	5.430	2.731	2.681	2.540	333.360	210.723	190.341	195.007	98.921	96.717	91.631	170.170	91.940	333.360	91.631
	70	LAB F	Bis(2-ethylhexyl)phthalate	2.000	1.253	10.333	14.072	12.470	12.300	11.021	9.378	0.987	563.572	409.252	383.330	380.234	330.795	268.058	18.040	347.271	167.665	563.572	18.040
	72	LAB A	Butyl benzl phthalate	0.400	0.149	0.927	0.860	0.830	0.829	0.700	0.720	0.351	180.852	164.827	162.041	160.829	146.537	132.707	63.034	139.490	32.031	180.852	63.034
	72	LAB B	Butyl benzl phthalate	0.400		4.8455	1.9642	1.7190	1.4765	1.0809	0.7360	0.5782	1211.375	491.050	429.750	369.125	270.225	184.000	144.550	443.032	334.661	1211.375	144.550
	72	LAB C	Butyl benzl phthalate	0.400	0.230	2.041	0.453	0.426	0.390	0.389	0.387	0.204	314.000	99.002	65.530	68.023	59.946	59.536	43.082	98.170	89.240	314.000	43.082
	72	LAB D	Butyl benzl phthalate	0.400		1.396	1.128	1.065	1.063	0.962	0.700	0.693	349.000	282.000	266.250	265.750	240.500	175.000	173.250	250.286	64.701	349.000	173.250
	72	LAB E	Butyl benzl phthalate	0.400	0.082	2.527	2.194	1.342	1.137	0.818	0.898	0.541	609.615	474.002	290.476	249.104	177.056	123.100	117.100	295.243	182.161	609.615	117.100
	72	LAB F	Butyl benzl phthalate	0.400	0.155	2.093	2.767	2.736	2.344	1.816	1.710	1.000	641.230	599.362	494.755	423.070	320.391	300.222	306.425	414.781	92.867	641.230	306.425
U038	75	LAB A	Chlorobenzilate	4.000	0.000	6.715	6.515	6.490	6.068	5.328	5.275	2.256	167.875	162.875	162.250	151.700	133.200	131.875	56.400	138.025	35.881	167.875	56.400
U038	75	LAB B	Chlorobenzilate	4.000		10.4801	9.2145	8.8932	6.6662	5.0915	4.8830	3.6495	262.003	230.363	222.330	166.655	127.288	122.075	91.238	174.565	61.071	262.003	91.238
U038	75	LAB C	Chlorobenzilate	4.000	0.000	9.953	3.773	3.618	3.220	3.216	3.091	2.807	248.825	94.325	90.450	80.500	80.400	77.275	70.175	105.993	60.707	248.825	70.175
U038	75	LAB D	Chlorobenzilate	4.000		8.085	6.577	6.431	6.344	6.123	5.955	5.406	202.125	164.425	160.775	158.600	153.075	148.875	135.150	160.432	19.216	202.125	135.150
U038	75	LAB E	Chlorobenzilate	4.000	0.000	13.336	13.090	12.922	11.704	6.610	6.077	5.624	333.400	327.250	323.050	292.600	165.250	151.925	140.600	247.725	83.802	333.400	140.600
U038	75	LAB F	Chlorobenzilate	4.000		23.134	20.382	18.140	17.367	15.408	14.388	13.549	578.350	509.550	453.500	434.175	385.200	359.700	338.725	437.029	79.206	578.350	338.725
U050	80	LAB A	Chrysene	100.000	0.000	137.660	119.280	111.750	110.770	100.233	94.741	63.985	137.660	119.280	111.750	110.770	100.233	94.741	63.985	105.488	24.167	137.660	63.985
U050	80	LAB B	Chrysene	100.000		143.2630	88.1849	71.0058	62.0647	55.0522	52.1774	44.4085	143.263	88.185	71.006	62.065	55.052	52.177	44.409	73.737	31.290	143.263	44.409
U050	80	LAB C	Chrysene	100.000	0.000	269.629	189.654	165.580	159.076	148.333	146.000	139.063	269.629	189.654	165.580	159.076	148.333	146.000	139.063	173.905	46.246	269.629	139.063
U050	80	LAB D	Chrysene	100.000		320.075	224.660	187.485	181.037	163.390	182.734	173.215	320.075	224.660	187.485	181.037	163.390	182.734	173.215	210.370	47.290	320.075	173.215

TABLE 8 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
U050	80	LAB E	Chrysene	100.000	0.000	360.677	331.254	165.765	143.730	142.524	107.015	102.103	360.677	331.254	165.765	143.730	142.524	107.015	102.103	193.295	99.009	360.677	102.103
U050	80	LAB F	Chrysene	100.000		58.536	41.341	32.752	32.041	31.111	21.116	19.921	58.536	41.341	32.752	32.041	31.111	21.116	19.921	33.831	12.089	58.536	19.921
U021	61	LAB A	Deleted (Benzidine)	500.000	0.000	4.120	3.360	2.909	2.651	2.433	2.032	1.055	0.824	0.672	0.582	0.530	0.487	0.406	0.211	0.531	0.191	0.824	0.211
U021	61	LAB B	Deleted (Benzidine)	500.000																			
U021	61	LAB C	Deleted (Benzidine)	500.000	0.000	16.187	12.510	11.720	6.645	5.360	1.486	1.513	3.237	2.502	2.344	1.329	1.072	0.297	0.303	1.583	1.029	3.237	0.297
U021	61	LAB D	Deleted (Benzidine)	500.000		2.451	0.909	0.442	0.426	0.115	0.054	0.030	0.490	0.182	0.088	0.085	0.023	0.011	0.006	0.126	0.169	0.490	0.006
U021	61	LAB E	Deleted (Benzidine)	500.000	0.123	105.936	95.200	95.112	49.520	45.773	37.500	31.217	21.187	19.040	19.022	9.904	9.155	7.500	6.243	13.150	6.962	21.187	6.243
U021	61	LAB F	Deleted (Benzidine)	500.000		1.380	0.922	0.000	0.000	0.000	0.000	0.000	0.276	0.184	0.000	0.000	0.000	0.000	0.000	0.066	0.106	0.276	0.000
	98	LAB A	Di-n-butyl phthalate	0.400	0.692	2.002	2.023	1.862	1.777	1.212	0.987	0.757	183.333	185.256	170.571	162.720	111.001	90.377	69.316	138.939	46.924	185.256	69.316
	98	LAB B	Di-n-butyl phthalate	0.400		0.6486	0.6390	0.5416	0.4153	0.3136	0.2567	0.2493	162.150	159.750	135.400	103.825	78.400	64.175	62.325	109.432	37.212	162.150	62.325
	98	LAB C	Di-n-butyl phthalate	0.400	0.510	1.458	1.229	1.199	1.196	1.156	1.180	1.000	160.220	135.105	131.786	131.420	127.012	129.683	109.890	132.159	11.731	160.220	109.890
	98	LAB D	Di-n-butyl phthalate	0.400		1.282	0.961	0.926	0.889	0.798	0.724	0.713	320.500	240.250	231.500	222.250	199.500	181.000	178.250	224.750	44.925	320.500	178.250
	98	LAB E	Di-n-butyl phthalate	0.400	1.100	1.358	1.331	1.206	1.171	1.066	0.806	0.739	90.517	88.703	80.400	78.067	71.084	53.714	49.271	73.108	14.940	90.517	49.271
	98	LAB F	Di-n-butyl phthalate	0.400	2.011	1.771	1.387	1.339	1.280	1.104	0.930	0.000	73.455	57.528	55.537	53.090	45.790	38.573	0.000	46.282	21.363	73.455	0.000
	104	LAB A	Di-n-octyl phthalate	0.400	0.000	0.641	0.617	0.503	0.484	0.369	0.283	0.271	160.250	154.250	125.750	121.000	92.250	70.750	67.750	113.143	34.707	160.250	67.750
	104	LAB B	Di-n-octyl phthalate	0.400		0.6593	0.6274	0.3744	0.3537	0.3489	0.3302	0.3101	164.825	156.850	93.600	88.425	87.225	82.550	77.525	107.286	34.610	164.825	77.525
	104	LAB C	Di-n-octyl phthalate	0.400	14.420	2.431	2.348	2.018	1.769	1.390	1.037	0.510	16.400	15.843	13.617	11.935	9.379	6.997	3.441	11.087	5.013	16.400	3.441
	104	LAB D	Di-n-octyl phthalate	0.400		0.491	0.469	0.446	0.438	0.413	0.403	0.377	122.750	117.250	111.500	109.500	103.250	100.750	94.250	108.464	9.106	122.750	94.250
	104	LAB E	Di-n-octyl phthalate	0.400	0.000	0.334	0.308	0.300	0.282	0.276	0.275	0.258	83.500	77.000	75.000	70.500	69.000	68.750	64.500	72.607	6.076	83.500	64.500
	104	LAB F	Di-n-octyl phthalate	0.400	0.112	1.025	0.855	0.772	0.667	0.640	0.619	0.564	200.195	166.992	150.781	130.273	125.000	120.898	110.156	143.471	27.470	200.195	110.156
U111	105	LAB A	Di-n-propylnitrosamine	4.000	0.000	1.627	0.489	0.220	0.206	0.205	0.179	0.099	40.675	12.225	5.500	5.150	5.125	4.475	2.475	10.804	12.615	40.675	2.475
U111	105	LAB B	Di-n-propylnitrosamine	4.000		3.9122	3.3932	3.3925	3.3693	2.8062	2.7541	2.5097	97.805	84.830	84.813	84.233	70.155	68.853	62.743	79.062	11.303	97.805	62.743
U111	105	LAB C	Di-n-propylnitrosamine	4.000	0.000	4.733	4.414	4.317	4.239	4.213	3.436	3.401	118.325	110.350	107.925	105.975	105.325	85.900	85.025	102.689	11.566	118.325	85.025
U111	105	LAB D	Di-n-propylnitrosamine	4.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U111	105	LAB E	Di-n-propylnitrosamine	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U111	105	LAB F	Di-n-propylnitrosamine	4.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U063	83	LAB A	Dibenz(a,h)anthracene	100.000	0.000	0.240	0.907	0.930	0.371	0.744	0.881	0.233	0.240	0.907	0.930	0.371	0.744	0.881	0.233	0.615	0.297	0.930	0.233
U063	83	LAB B	Dibenz(a,h)anthracene	100.000		0.9010	0.7303	3.0754	3.1743	2.3487	2.2034	2.1086	0.901	0.730	3.075	3.174	2.349	2.203	2.109	2.077	0.974	3.174	0.730
U063	83	LAB C	Dibenz(a,h)anthracene	100.000	0.000	34.130	34.100	26.254	24.072	21.101	20.074	17.229	34.130	34.100	26.254	24.072	21.101	20.074	17.229	25.280	6.099	34.130	17.229
U063	83	LAB D	Dibenz(a,h)anthracene	100.000		19.871	14.556	12.083	10.199	10.016	9.494	8.449	19.871	14.556	12.083	10.199	10.016	9.494	8.449	12.095	3.686	19.871	8.449
U063	83	LAB E	Dibenz(a,h)anthracene	100.000	0.000	23.322	20.089	20.262	18.548	18.341	17.776	14.262	23.322	20.089	20.262	18.548	18.341	17.776	14.262	18.943	2.585	23.322	14.262
U063	83	LAB F	Dibenz(a,h)anthracene	100.000		7.094	4.976	4.067	3.632	3.407	0.000	0.000	7.094	4.976	4.067	3.632	3.407	0.000	0.000	3.311	2.436	7.094	0.000
	85	LAB A	Dibenz(a,i)pyrene	40.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	85	LAB B	Dibenz(a,i)pyrene	40.000																			
	85	LAB C	Dibenz(a,i)pyrene	40.000	0.000	22.928	9.668	6.649	6.580	6.001	1.455	0.771	57.320	24.170	16.620	16.450	15.003	3.638	1.928	19.303	17.114	57.320	1.928
	85	LAB D	Dibenz(a,i)pyrene	40.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	85	LAB E	Dibenz(a,i)pyrene	40.000	0.000	0.432	0.418	0.356	0.312	0.270	0.236	0.213	1.080	1.045	0.890	0.780	0.675	0.590	0.533	0.799	0.196	1.080	0.533
	85	LAB F	Dibenz(a,i)pyrene	40.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	84	LAB A	Dibenzo(a,e)pyrene	40.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	84	LAB B	Dibenzo(a,e)pyrene	40.000																			
	84	LAB C	Dibenzo(a,e)pyrene	40.000	0.000	21.602	14.816	10.203	9.779	9.102	8.690	2.353	54.005	37.040	25.508	24.448	22.755	21.725	5.883	27.337	13.792	54.005	5.883
	84	LAB D	Dibenzo(a,e)pyrene	40.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	84	LAB E	Dibenzo(a,e)pyrene	40.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	84	LAB F	Dibenzo(a,e)pyrene	40.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	92	LAB A	Diethyl phthalate	0.400	0.000	0.608	0.587	0.572	0.389	0.258	0.056	0.035	152.000	146.750	143.000	97.250	64.500	14.000	8.750	89.464	57.167	152.000	8.750
	92	LAB B	Diethyl phthalate	0.400		0.3687	0.3596	0.2982	0.2901	0.2583	0.2255	0.0189	92.175	89.900	74.550	72.525	64.575	56.375	4.725	64.975	27.204	92.175	4.725
	92	LAB C	Diethyl phthalate	0.400	0.000	3.725	0.665	0.578	0.574	0.570	0.565	0.409	931.250	166.250	144.500	143.500	142.500	141.250	102.250	253.071	277.421	931.250	102.250
	92	LAB D	Diethyl phthalate	0.400		0.489	0.456	0.444	0.387	0.379	0.179	0.048	122.250	114.000	111.000	96.750	94.750	44.750	12.000	85.214	37.077	122.250	12.000
	92	LAB E	Diethyl phthalate	0.400	0.155	0.602	0.500	0.481	0.444	0.416	0.414	0.394	108.468	90.000	86.667	80.000	74.955	74.595	70.991	83.668	12.540	108.468	70.991
	92	LAB F	Diethyl phthalate	0.400	0.227	2.621	1.992	1.986	1.880	1.883	1.876	1.232	418.022	317.703	316.746	299.219	299.421	297.783	196.491	293.484	63.180	418.022	196.491
	97	LAB A	Dimethyl phthalate	0.400	0.000	0.498	0.465	0.447	0.434	0.381	0.375	0.178	124.500	116.250	111.750	108.500	95.250	93.750	44.500	99.214	24.530	124.500	44.500
	97	LAB B	Dimethyl phthalate	0.400		0.3803	0.3595	0.3543	0.3156	0.3147	0.2969	0.2899	95.075	89.875	88.575	78.900	78.675	74.225	72.475	82.543	7.602	95.075	72.475
	97	LAB C	Dimethyl phthalate	0.400	0.000	0.395	0.136	0.000	0.000	0.000	0.000	0.000	98.750	34.000	0.000	0.000	0.000	0.000	0.000	18.964	34.621	98.750	0.000
	97	LAB D	Dimethyl phthalate	0.400		0.984	0.942	0.434	0.386	0.371	0.351	0.309	246.000	235.500	108.500	96.500	92.750	87.750	77.250	134.893	67.646	246.000	77.250
	97	LAB E	Dimethyl phthalate	0.400	0.000	0.381	0.106	0.101	0.091	0.086	0.083	0.075	95.250	26.500	25.250	22.750	21.500	20.750	18.750	32.964	25.848	95.250	18.750
	97	LAB F	Dimethyl phthalate	0.400		0.372	0.357	0.348	0.345	0.342	0.337	0.184	93.000	89.250	87.000	86.250	85.500	84.250	46.000	81.607	14.779	93.000	46.000

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
MIVOLATILE ORGANICS																							
	8	LAB A	Ethyl methanesulfonate	5.000	0.000	3.877	3.771	3.667	3.490	3.207	2.472	1.310	77.540	75.420	73.340	69.800	64.140	49.440	26.200	62.269	17.180	77.540	26.200
		LAB B	Ethyl methanesulfonate	5.000		4.0306	3.7138	3.6097	3.4940	3.4505	3.2832	3.2020	80.612	74.276	72.194	69.880	69.010	65.664	64.040	70.811	5.100	80.612	64.040
	8	LAB C	Ethyl methanesulfonate	5.000	0.000	5.919	5.599	5.566	5.292	5.180	5.013	4.310	118.380	111.980	111.320	105.840	103.600	100.260	86.200	105.369	9.601	118.380	86.200
	8	LAB D	Ethyl methanesulfonate	5.000		4.905	4.774	4.641	4.526	4.618	3.993	3.560	98.100	95.480	92.820	90.520	92.360	79.860	71.200	88.620	8.912	98.100	71.200
		LAB E	Ethyl methanesulfonate	5.000	0.000	3.571	3.301	3.374	3.320	3.313	3.255	2.867	71.420	66.020	67.480	66.400	66.260	65.100	57.340	65.717	3.905	71.420	57.340
		LAB F	Ethyl methanesulfonate	5.000		6.515	6.331	6.313	6.116	5.711	5.386	4.497	130.300	126.620	126.260	122.320	114.220	107.720	89.940	116.769	13.003	130.300	89.940
U120	108	LAB A	Fluoranthene	10.000	0.170	9.904	9.667	9.240	7.090	7.887	7.317	3.072	98.387	96.056	91.047	77.000	77.500	71.000	30.070	77.294	18.243	98.387	30.070
U120	108	LAB B	Fluoranthene	10.000		10.3079	9.7198	9.9999	9.1909	9.0449	9.7007	9.0116	103.079	97.198	99.999	91.909	90.449	97.007	90.116	95.680	4.497	103.079	90.116
U120	108	LAB C	Fluoranthene	10.000	0.150	10.344	15.699	15.256	13.782	13.327	11.090	0.093	101.925	154.842	150.326	136.002	131.300	109.360	0.010	120.477	51.366	154.842	0.010
U120	108	LAB D	Fluoranthene	10.000		11.669	10.966	10.922	10.711	10.341	10.122	9.851	116.690	109.660	109.220	107.110	103.410	101.220	98.510	106.546	6.903	116.690	98.510
U120	108	LAB E	Fluoranthene	10.000	0.104	9.024	9.059	9.034	8.700	8.881	8.862	7.993	89.219	87.954	89.410	86.104	86.026	79.700	77.021	87.732	7.301	89.410	77.021
U120	108	LAB F	Fluoranthene	10.000	0.037	30.848	7.010	7.462	7.251	9.090	6.934	6.226	307.010	70.100	74.345	72.243	89.042	69.004	62.021	116.177	110.074	307.010	62.021
	109	LAB A	Fluorene	2.000	0.000	2.233	2.194	2.100	1.944	1.910	1.909	0.932	111.650	109.700	105.000	97.200	95.500	95.450	46.600	94.443	20.226	111.650	46.600
	109	LAB B	Fluorene	2.000		1.9190	1.9087	1.8418	1.8543	1.8403	1.8018	1.4017	95.950	95.435	92.090	92.715	92.015	90.090	70.085	89.770	8.733	95.950	70.085
	109	LAB C	Fluorene	2.000	0.000	2.057	1.978	1.945	1.938	1.850	1.717	1.589	102.850	98.900	97.250	96.900	92.500	85.850	79.450	93.443	7.545	102.850	79.450
	109	LAB D	Fluorene	2.000		1.746	1.740	1.715	1.674	1.671	1.648	1.626	87.300	87.000	85.750	83.700	83.550	82.400	81.300	84.429	2.137	87.300	81.300
	109	LAB E	Fluorene	2.000	0.000	2.357	2.344	2.264	2.215	2.103	2.000	1.990	117.850	117.200	113.200	110.750	105.150	100.000	99.500	109.100	7.022	117.850	99.500
	109	LAB F	Fluorene	2.000		1.633	1.543	1.539	1.482	1.412	1.394	1.323	81.650	77.150	76.950	74.100	70.600	69.700	66.150	73.400	5.168	81.650	66.150
U127	110	LAB A	Hexachlorobenzene	0.400	0.110	0.613	0.604	0.499	0.498	0.455	0.410	0.170	120.190	118.431	97.250	99.004	86.210	82.167	34.810	91.152	26.466	120.190	34.810
U127	110	LAB B	Hexachlorobenzene	0.400		0.7777	0.5889	0.5718	0.5233	0.4710	0.4645	0.4569	194.425	147.225	142.950	130.825	117.750	116.125	114.225	137.079	29.150	194.425	114.225
U127	110	LAB C	Hexachlorobenzene	0.400	0.000	0.693	0.513	0.453	0.435	0.397	0.382	0.379	173.250	128.250	113.250	108.750	99.250	95.500	94.750	116.143	25.740	173.250	94.750
U127	110	LAB D	Hexachlorobenzene	0.400		0.564	0.573	0.555	0.542	0.533	0.508	0.495	140.900	143.250	138.750	135.500	133.250	127.000	123.750	136.714	6.659	143.250	123.750
U127	110	LAB E	Hexachlorobenzene	0.400	0.101	0.700	0.666	0.661	0.653	0.646	0.606	0.554	141.317	136.720	131.936	130.220	129.341	120.000	112.875	128.916	8.766	141.317	112.875
U127	110	LAB F	Hexachlorobenzene	0.400		0.430	0.414	0.396	0.389	0.374	0.365	0.354	107.500	103.500	99.000	97.250	93.500	91.250	88.500	97.214	6.284	107.500	88.500
U128	111	LAB A	Hexachlorobutadiene	2.000	0.000	2.220	2.031	1.943	1.938	1.882	1.879	0.700	111.000	101.550	97.150	96.900	94.100	93.950	35.000	89.950	23.329	111.000	35.000
U128	111	LAB B	Hexachlorobutadiene	2.000		1.7013	1.5152	1.0830	0.8835	0.8598	0.8704	0.5435	85.065	75.760	54.150	44.175	42.990	43.520	27.175	53.262	19.067	85.065	27.175
U128	111	LAB C	Hexachlorobutadiene	2.000	0.000	2.412	2.328	2.169	2.147	2.116	2.050	1.933	120.600	116.400	108.450	107.350	105.800	102.500	96.650	108.250	7.407	120.600	96.650
U128	111	LAB D	Hexachlorobutadiene	2.000		2.409	2.312	2.248	2.235	2.106	2.001	2.019	120.450	115.600	112.400	111.750	105.300	100.050	100.950	109.500	6.133	120.450	100.050
U128	111	LAB E	Hexachlorobutadiene	2.000	0.000	2.340	2.282	2.160	2.137	1.977	1.829	1.892	117.000	114.100	108.000	106.850	98.850	91.450	94.600	104.407	8.806	117.000	91.450
U128	111	LAB F	Hexachlorobutadiene	2.000		1.521	1.432	1.401	1.292	1.287	1.227	1.221	76.050	71.600	70.050	64.600	64.350	61.350	61.050	67.007	5.244	76.050	61.050
U130	112	LAB A	Hexachlorocyclopentadiene	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U130	112	LAB B	Hexachlorocyclopentadiene	500.000																			
U130	112	LAB C	Hexachlorocyclopentadiene	500.000	0.000	0.700	0.000	0.000	0.000	0.000	0.000	0.000	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.053	0.140	0.000
U130	112	LAB D	Hexachlorocyclopentadiene	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U130	112	LAB E	Hexachlorocyclopentadiene	500.000	0.000	61.313	55.411	48.162	42.244	38.010	32.005	27.120	12.263	11.082	9.632	8.449	7.602	6.401	5.424	8.693	2.307	12.263	5.424
U130	112	LAB F	Hexachlorocyclopentadiene	500.000		3.207	0.000	0.000	0.000	0.000	0.000	0.000	0.641	0.000	0.000	0.000	0.000	0.000	0.000	0.092	0.242	0.641	0.000
	113	LAB A	Hexachloroethane	4.000	0.000	3.097	3.051	2.876	2.862	2.343	2.292	0.917	77.425	76.275	71.900	71.550	58.575	57.300	22.925	62.279	17.078	77.425	22.925
	113	LAB B	Hexachloroethane	4.000		2.5761	2.4562	2.3775	2.2523	2.1640	2.1455	2.0854	64.403	61.405	59.438	56.308	54.100	53.639	52.135	57.347	4.193	64.403	52.135
	113	LAB C	Hexachloroethane	4.000	0.000	3.286	3.281	3.264	3.234	3.091	3.049	3.041	82.150	82.025	81.600	80.850	77.275	76.225	76.025	79.343	2.891	82.150	76.025
	113	LAB D	Hexachloroethane	4.000		4.003	3.823	3.690	3.499	3.473	3.370	3.342	100.075	95.575	92.250	87.475	86.825	84.250	83.550	90.000	6.717	100.075	83.550
	113	LAB E	Hexachloroethane	4.000	0.000	2.696	2.623	2.309	2.297	2.265	2.017	1.951	67.400	65.575	57.725	57.425	56.625	50.425	48.775	57.707	6.450	67.400	48.775
	113	LAB F	Hexachloroethane	4.000		24.096	6.841	2.616	2.572	2.530	2.142	2.116	602.400	171.025	65.400	64.300	63.250	53.550	52.900	153.293	187.369	602.400	52.900
U132	114	LAB A	Hexachlorophene	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U132	114	LAB B	Hexachlorophene	500.000																			
U132	114	LAB C	Hexachlorophene	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U132	114	LAB D	Hexachlorophene	500.000		747.533	664.067	190.132	38.551	37.144	0.000	0.000	149.507	132.813	38.026	7.710	7.429	0.000	0.000	47.926	60.362	149.507	0.000
U132	114	LAB E	Hexachlorophene	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U132	114	LAB F	Hexachlorophene	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U243	115	LAB A	Hexachloropropene	500.000	0.000	0.015	0.012	0.012	0.011	0.000	0.000	0.000	0.003	0.002	0.002	0.002	0.000	0.000	0.000	0.001	0.001	0.003	0.000
U243	115	LAB B	Hexachloropropene	500.000																			
U243	115	LAB C	Hexachloropropene	500.000	0.000	63.106	42.093	23.907	16.661	11.381	8.991	2.946	12.621	8.419	4.781	3.332	2.276	1.798	0.589	4.831	3.871	12.621	0.589
U243	115	LAB D	Hexachloropropene	500.000		1.340	1.276	1.207	1.202	1.129	1.048	0.615	0.268	0.255	0.241	0.240	0.226	0.210	0.123	0.224	0.045	0.268	0.123
U243	115	LAB E	Hexachloropropene	500.000	0.000	118.213	100.545	94.358	90.200	89.253	85.168	77.740	23.643	20.109	18.872	18.042	17.851	17.034	15.548	18.728	2.300	23.643	15.548
U243	115	LAB F	Hexachloropropene	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U141	117	LAB A	Isosafrole	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U141	117	LAB B	Isosafrole	0.400		0.3122	0.2728	0.2611	0.2492	0.2453	0.2401	0.2352	78.050	68.200	65.275	62.300	61.325	60.025	58.800	64.854	6.148	78.050	58.800

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
U141	117	LAB C	Isosafrole	0.400	0.000	2.482	2.437	2.422	2.413	2.395	2.340	2.299	620.500	609.250	605.500	603.250	598.750	585.000	574.750	599.571	15.075	620.500	574.750
U141	117	LAB D	Isosafrole	0.400		5.729	5.656	5.495	5.423	5.374	5.364	0.337	1432.250	1414.000	1373.750	1355.750	1343.500	1341.000	84.250	1192.071	459.419	1432.250	84.250
U141	117	LAB E	Isosafrole	0.400	0.000	0.323	0.164	0.156	0.132	0.129	0.119	0.087	80.750	41.000	39.000	33.000	32.250	29.750	21.750	39.643	17.794	80.750	21.750
U141	117	LAB F	Isosafrole	0.400		1.597	1.519	1.500	1.491	1.488	1.474	1.308	399.250	379.750	375.000	372.750	372.000	368.500	327.000	370.607	20.129	399.250	327.000
	0	LAB A	Maleic Anhydride	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		LAB B	Maleic Anhydride	500.000		1.0096	0.7400	0.7211	0.4383	0.3044	0.2567	0.1325	0.202	0.148	0.144	0.088	0.061	0.051	0.027	0.103	0.059	0.202	0.027
	0	LAB C	Maleic Anhydride	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0	LAB D	Maleic Anhydride	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		LAB E	Maleic Anhydride	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
		LAB F	Maleic Anhydride	500.000		87.749	84.392	81.323	78.861	64.130	53.555	40.906	17.549	16.878	16.265	15.772	12.826	10.711	8.181	14.026	3.645	17.549	8.181
U155	118	LAB A	Methapyrilene	4.000	0.000	0.978	0.791	0.581	0.544	0.504	0.492	0.435	24.450	19.775	14.525	13.600	12.600	12.300	10.875	15.446	4.814	24.450	10.875
U155	118	LAB B	Methapyrilene	4.000		1.4196	1.1127	1.0834	0.9167	0.6921	0.6353	0.5245	35.490	27.818	27.085	22.918	17.303	15.883	13.113	22.801	7.334	35.490	13.113
U155	118	LAB C	Methapyrilene	4.000	0.000	2.908	2.571	2.542	1.954	1.822	1.719	1.071	72.700	64.275	63.550	48.850	45.550	42.975	26.775	52.096	14.849	72.700	26.775
U155	118	LAB D	Methapyrilene	4.000		0.890	0.228	0.167	0.154	0.133	0.089	0.028	22.250	5.700	4.175	3.850	3.325	2.225	0.700	6.032	6.770	22.250	0.700
U155	118	LAB E	Methapyrilene	4.000	0.040	0.201	0.110	0.000	0.000	0.000	0.000	0.000	4.975	2.723	0.000	0.000	0.000	0.000	0.000	1.100	1.949	4.975	0.000
U155	118	LAB F	Methapyrilene	4.000		5.761	4.830	4.763	4.555	3.633	2.709	1.574	144.025	120.750	119.075	113.875	90.825	67.725	39.350	99.375	34.579	144.025	39.350
	36	LAB A	Methyl methanesulfonate	5.000	0.000	3.389	3.021	2.899	2.737	2.592	2.050	1.481	67.780	60.420	57.980	54.740	51.840	41.000	29.620	51.911	14.303	67.780	29.620
	36	LAB B	Methyl methanesulfonate	5.000		3.8753	3.5199	3.4749	3.4036	2.9875	2.9028	2.0743	77.506	70.398	69.498	68.072	59.750	58.056	41.486	63.538	10.882	77.506	41.486
	36	LAB C	Methyl methanesulfonate	5.000	0.000	5.531	5.369	5.335	5.273	5.213	5.012	3.400	110.620	107.380	106.700	105.460	104.260	100.240	68.000	100.380	13.839	110.620	68.000
	36	LAB D	Methyl methanesulfonate	5.000		4.020	3.935	3.895	3.595	3.540	3.475	3.461	80.400	78.700	77.900	71.900	70.800	69.500	69.220	74.060	4.499	80.400	69.220
	36	LAB E	Methyl methanesulfonate	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	36	LAB F	Methyl methanesulfonate	5.000		2.105	2.078	1.836	1.753	1.733	1.214	0.949	42.100	41.560	36.720	35.060	34.660	24.280	18.980	33.337	8.053	42.100	18.980
	132	LAB A	N-Nitrosomorpholine	4.000	0.000	3.822	3.614	2.681	2.484	2.377	2.273	1.121	95.550	90.350	67.025	62.100	59.425	56.825	28.025	65.614	19.903	95.550	28.025
	132	LAB B	N-Nitrosomorpholine	4.000		5.9108	5.5527	5.5265	5.1451	5.1227	4.8270	4.2838	147.770	138.818	138.163	128.628	128.068	120.675	107.095	129.888	12.484	147.770	107.095
	132	LAB C	N-Nitrosomorpholine	4.000	0.000	5.875	5.427	4.825	4.730	4.609	4.514	3.324	146.875	135.675	120.625	118.250	115.225	112.850	83.100	118.943	17.164	146.875	83.100
	132	LAB D	N-Nitrosomorpholine	4.000		3.730	3.356	3.352	3.333	2.906	2.803	2.594	93.250	83.900	83.800	83.325	72.650	70.075	64.850	78.836	9.178	93.250	64.850
	132	LAB E	N-Nitrosomorpholine	4.000		3.980	3.821	3.820	3.563	3.555	3.516	3.003	99.500	95.525	95.500	89.075	88.875	87.900	75.075	90.207	7.388	99.500	75.075
	132	LAB F	N-Nitrosomorpholine	4.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U172	128	LAB A	n-Nitrosodi-n-butylamine	4.000	0.000	4.277	4.043	0.222	0.206	0.205	0.179	0.099	106.925	101.075	5.550	5.150	5.125	4.475	2.475	32.968	44.961	106.925	2.475
U172	128	LAB B	n-Nitrosodi-n-butylamine	4.000		3.5945	3.5742	3.3658	3.3221	3.1981	3.1940	3.0943	89.863	89.355	84.145	83.053	79.953	79.850	77.358	83.368	4.464	89.863	77.358
U172	128	LAB C	n-Nitrosodi-n-butylamine	4.000	0.000	5.233	5.056	4.863	4.842	3.870	3.680	3.672	130.825	126.400	121.575	121.050	96.750	92.000	91.800	111.486	16.222	130.825	91.800
U172	128	LAB D	n-Nitrosodi-n-butylamine	4.000		4.237	4.163	3.947	3.935	3.889	3.884	3.827	105.925	104.075	98.675	98.375	97.225	97.100	95.675	99.579	3.577	105.925	95.675
U172	128	LAB E	n-Nitrosodi-n-butylamine	4.000		4.048	3.820	3.699	3.550	3.343	3.158	3.131	101.200	95.500	92.475	88.750	83.575	78.950	78.275	88.389	8.341	101.200	78.275
U172	128	LAB F	n-Nitrosodi-n-butylamine	4.000		4.835	4.775	4.725	4.279	4.227	4.043	3.364	120.875	119.375	118.125	106.975	105.675	101.075	84.100	108.029	12.081	120.875	84.100
U174	129	LAB A	n-Nitrosodiethylamine	100.000	0.000	46.899	43.433	41.145	39.204	38.721	35.213	15.790	46.899	43.433	41.145	39.204	38.721	35.213	15.790	37.201	9.360	46.899	15.790
U174	129	LAB B	n-Nitrosodiethylamine	100.000		48.3291	48.2051	44.6954	40.7994	39.0756	35.0935	20.0789	48.329	48.205	44.695	40.799	39.076	35.094	20.079	39.468	9.200	48.329	20.079
U174	129	LAB C	n-Nitrosodiethylamine	100.000	0.000	102.524	102.077	101.396	99.618	96.985	92.002	16.991	102.524	102.077	101.396	99.618	96.985	92.002	16.991	87.370	28.934	102.524	16.991
U174	129	LAB D	n-Nitrosodiethylamine	100.000		75.614	73.732	72.966	71.084	70.320	69.230	65.000	75.614	73.732	72.966	71.084	70.320	69.230	65.000	71.278	3.043	75.614	65.000
U174	129	LAB E	n-Nitrosodiethylamine	100.000	0.000	56.074	55.420	54.587	54.201	51.287	50.820	49.000	56.074	55.420	54.587	54.201	51.287	50.820	49.000	53.056	2.497	56.074	49.000
U174	129	LAB F	n-Nitrosodiethylamine	100.000		79.879	74.862	71.373	61.794	61.648	60.483	51.735	79.879	74.862	71.373	61.794	61.648	60.483	51.735	65.968	9.013	79.879	51.735
P082	130	LAB A	n-Nitrosodimethylamine	4.000	0.000	2.155	2.030	1.764	1.651	1.640	1.445	0.827	53.875	50.750	44.100	41.275	41.000	36.125	20.675	41.114	10.054	53.875	20.675
P082	130	LAB B	n-Nitrosodimethylamine	4.000		3.1563	2.7640	2.6181	1.4103	0.9837	0.8387	0.5345	78.908	69.100	65.453	35.258	24.593	20.968	13.363	43.949	24.650	78.908	13.363
P082	130	LAB C	n-Nitrosodimethylamine	4.000	0.000	7.411	7.226	7.105	6.880	6.434	6.254	2.609	185.275	180.650	177.625	172.000	160.850	156.350	65.225	156.854	38.610	185.275	65.225
P082	130	LAB D	n-Nitrosodimethylamine	4.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P082	130	LAB E	n-Nitrosodimethylamine	4.000		2.849	2.616	2.530	2.468	2.390	2.358	2.247	71.225	65.400	63.250	61.700	59.750	58.950	56.175	62.350	4.563	71.225	56.175
P082	130	LAB F	n-Nitrosodimethylamine	4.000		4.222	4.020	3.812	3.555	3.331	2.693	2.427	105.550	100.500	95.300	88.875	83.275	67.325	60.675	85.929	16.177	105.550	60.675
	210	LAB A	N-Nitrosodiphenylamine	0.400	0.000	15.346	14.359	14.021	13.562	13.475	12.486	8.271	3836.500	3589.750	3505.250	3390.500	3368.750	3121.500	2067.750	3268.429	530.720	3836.500	2067.750
	210	LAB B	N-Nitrosodiphenylamine	0.400		0.4409	0.3226	0.2173	0.2027	0.1981	0.1503	0.1403	110.225	80.650	54.325	50.675	49.525	37.575	35.075	59.721	24.910	110.225	35.075
	210	LAB C	N-Nitrosodiphenylamine	0.400	0.000	0.368	0.000	0.000	0.000	0.000	0.000	0.000	92.000	0.000	0.000	0.000	0.000	0.000	0.000	13.143	32.193	92.000	0.000
	210	LAB D	N-Nitrosodiphenylamine	0.400		0.313	0.292	0.260	0.192	0.184	0.181	0.172	78.250	73.000	65.000	48.000	46.000	45.250	43.000	56.929	13.667	78.250	43.000
	210	LAB E	N-Nitrosodiphenylamine	0.400		1.183	0.237	0.237	0.233	0.230	0.192	0.156	295.750	59.250	59.250	58.250	57.500	48.000	39.000	88.143	85.046	295.750	39.000
	210	LAB F	N-Nitrosodiphenylamine	0.400		0.774	0.709	0.683	0.681	0.587	0.058	0.053	193.500	177.250	170.750	170.250	146.750	14.500	13.250	126.607	72.424	193.500	13.250
	131	LAB A	N-Nitrosomethylethylamine	4.000	0.000	2.714	2.670	2.576	2.350	2.328	1.874	0.753	67.850	66.750	64.400	58.750	58.200	46.850	18.825	54.518	15.888	67.850	18.825
	131	LAB B	N-Nitrosomethylethylamine	4.000		3.6814	3.1334	3.1044	3.0776	2.9194	2.6912	1.3201	92.035	78.335	77.610	76.940	72.985	67.280	33.003	71.170	17.067	92.035	33.003
	131	LAB C	N-Nitrosomethylethylamine	4.000	0.000	7.403	6.363	5.839	5.210	3.781	3.588	3.405	185.075	159.075	145.975	130.250	94.525	89.700	85.125	127.104	35.090	185.075	85.125
	131	LAB D	N-Nitrosomethylethylamine	4.000		4.570	4.064	3.832	3.635	3.590	3.585	3.531	114.250	101.600	95.800	90.875	89.750	89.625	88.275	95.739	8.890	114.250	88.275

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BOAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
	131	LAB E	N-Nitrosomethylethylamine	4.000		3.422	3.185	3.174	3.106	3.106	3.041	2.850	85.550	79.625	79.350	77.650	77.650	76.025	71.250	78.157	4.049	85.550	71.250
	131	LAB F	N-Nitrosomethylethylamine	4.000		3.459	3.351	3.289	3.251	3.143	2.862	2.467	86.475	83.775	82.225	81.275	78.575	71.550	61.675	77.936	7.848	86.475	61.675
U179	133	LAB A	n-Nitrosopiperidine	2.000	0.000	1.768	1.575	1.531	1.454	1.412	1.234	0.536	88.400	78.750	76.550	72.700	70.600	61.700	26.800	67.929	19.490	88.400	26.800
U179	133	LAB B	n-Nitrosopiperidine	2.000		1.2430	1.2244	1.1955	1.1713	1.1687	1.1653	1.1502	62.150	61.220	59.775	58.565	58.435	58.265	57.510	59.417	1.681	62.150	57.510
U179	133	LAB C	n-Nitrosopiperidine	2.000	0.000	2.167	2.117	2.020	2.470	2.272	2.040	1.517	108.350	105.850	101.000	123.500	113.600	102.000	75.850	104.307	13.381	123.500	75.850
U179	133	LAB D	n-Nitrosopiperidine	2.000		1.676	1.619	1.545	1.515	1.514	1.441	1.369	83.800	80.950	77.250	75.750	75.700	72.050	68.450	76.279	4.791	83.800	68.450
U179	133	LAB E	n-Nitrosopiperidine	2.000		4.445	3.995	3.821	3.797	3.737	3.636	3.262	222.250	199.750	191.050	189.850	186.850	181.800	163.100	190.664	18.626	222.250	163.100
U179	133	LAB F	n-Nitrosopiperidine	2.000		3.040	2.920	2.769	2.687	2.362	1.841	1.410	152.000	146.000	138.450	134.350	118.100	92.050	70.500	121.636	29.044	152.000	70.500
U180	134	LAB A	n-Nitrosopyrrolidine	4.000	0.000	3.683	3.021	2.681	0.000	0.000	0.000	0.000	92.075	75.525	67.025	0.000	0.000	0.000	0.000	33.518	39.266	92.075	0.000
U180	134	LAB B	n-Nitrosopyrrolidine	4.000		2.6947	2.6497	1.9564	1.0444	0.7627	0.7012	0.1618	67.368	66.243	48.910	26.110	19.068	17.530	4.045	35.611	23.810	67.368	4.045
U180	134	LAB C	n-Nitrosopyrrolidine	4.000	0.000	4.306	4.233	3.495	3.021	2.920	2.242	2.144	107.650	105.825	87.375	75.525	73.000	56.050	53.600	79.861	20.090	107.650	53.600
U180	134	LAB D	n-Nitrosopyrrolidine	4.000		3.766	3.378	2.918	2.791	2.413	2.201	2.178	94.150	84.450	72.950	69.775	60.325	55.025	54.450	70.161	13.949	94.150	54.450
U180	134	LAB E	n-Nitrosopyrrolidine	4.000		3.092	3.020	2.960	2.960	2.906	2.819	2.647	77.300	75.500	74.000	74.000	72.650	70.475	66.175	72.729	3.664	77.300	66.175
U180	134	LAB F	n-Nitrosopyrrolidine	4.000		5.046	4.499	4.464	4.415	4.367	4.041	2.696	126.150	112.475	111.600	110.375	109.175	101.025	67.400	105.457	18.002	126.150	67.400
U165	121	LAB A	Naphthalene	0.400	0.933	5.985	1.527	1.362	1.359	1.311	1.298	0.491	449.012	114.894	102.178	101.950	98.350	97.374	36.834	142.780	129.799	449.012	36.834
U165	121	LAB B	Naphthalene	0.400		1.0822	1.0202	1.0135	0.9924	0.9511	0.9215	0.8906	270.550	255.050	253.375	248.100	237.775	230.375	222.650	245.411	16.100	270.550	222.650
U165	121	LAB C	Naphthalene	0.400	0.740	1.499	1.329	1.296	1.295	1.284	1.177	1.174	131.491	116.579	113.684	113.596	112.632	103.246	102.982	113.459	8.882	131.491	102.982
U165	121	LAB D	Naphthalene	0.400		1.601	1.550	1.520	1.480	1.460	1.451	1.424	400.250	387.500	380.000	370.000	365.000	362.750	356.000	374.500	14.406	400.250	356.000
U165	121	LAB E	Naphthalene	0.400	0.482	1.132	1.002	0.986	0.959	0.889	0.855	0.852	128.345	113.605	111.791	108.730	100.794	96.939	96.599	108.115	10.450	128.345	96.599
U165	121	LAB F	Naphthalene	0.400		1.233	1.197	1.165	1.181	1.115	1.094	1.088	308.250	299.250	291.250	295.250	278.750	273.500	272.000	288.036	13.102	308.250	272.000
U169	128	LAB A	Nitrobenzene	10.000	0.000	6.466	5.720	5.324	4.743	4.045	3.799	1.603	64.660	57.200	53.240	47.430	40.450	37.990	16.030	45.286	14.729	64.660	16.030
U169	128	LAB B	Nitrobenzene	10.000		7.0582	7.0512	7.0135	6.8004	6.7961	6.6662	6.6932	70.582	70.512	70.135	68.004	67.961	66.662	66.932	68.684	3.430	70.582	66.662
U169	128	LAB C	Nitrobenzene	10.000	0.000	27.810	14.920	14.176	13.516	13.290	13.037	8.719	278.100	149.200	141.760	135.160	132.900	130.370	87.190	150.669	58.224	278.100	87.190
U169	128	LAB D	Nitrobenzene	10.000		10.232	9.549	9.316	9.283	9.250	9.139	8.869	102.320	95.490	93.160	92.830	92.500	91.390	88.690	93.784	3.977	102.320	88.690
U169	128	LAB E	Nitrobenzene	10.000	0.000	8.651	8.314	7.972	7.707	7.703	7.602	7.465	86.510	83.140	79.720	77.070	77.030	76.020	74.650	79.077	4.090	86.510	74.650
U169	128	LAB F	Nitrobenzene	10.000		11.694	11.434	10.467	9.812	9.893	9.537	8.339	116.940	114.340	104.670	98.120	98.930	95.370	83.390	101.394	10.794	116.940	83.390
U052	81	LAB A	o-Cresol	1.000	0.000	0.784	0.612	0.502	0.555	0.517	0.176	0.000	78.400	61.200	50.200	55.500	51.700	17.600	0.000	44.943	26.300	78.400	0.000
U052	81	LAB B	o-Cresol	1.000		0.9927	0.9652	0.9420	0.9240	0.8746	0.8332	0.7556	99.270	96.520	94.200	92.400	87.460	83.320	75.560	89.819	7.499	99.270	75.560
U052	81	LAB C	o-Cresol	1.000	0.000	2.010	1.941	1.764	1.693	1.687	1.499	0.879	201.000	194.100	176.400	169.300	168.700	149.900	87.900	162.757	33.827	201.000	87.900
U052	81	LAB D	o-Cresol	1.000		1.059	1.025	0.994	0.983	0.979	0.960	0.833	105.900	102.500	99.400	98.300	97.900	96.000	83.300	96.471	7.411	105.900	83.300
U052	81	LAB E	o-Cresol	1.000	0.000	0.923	0.904	0.902	0.761	0.727	0.711	0.676	92.300	90.400	90.200	76.100	72.700	71.100	67.600	78.657	8.984	92.300	67.600
U052	81	LAB F	o-Cresol	1.000		1.377	1.327	1.292	1.256	0.979	0.868	0.192	137.700	132.700	129.200	125.600	97.900	86.800	19.200	104.143	38.678	137.700	19.200
U197	66	LAB A	p-Benzoquinone	500.000	0.000	7.462	4.714	4.173	3.609	0.490	0.000	0.000	1.492	0.943	0.835	0.722	0.098	0.000	0.000	0.584	0.520	1.492	0.000
U197	66	LAB B	p-Benzoquinone	500.000		0.7667	0.7006	0.6501	0.6484	0.5596	0.4256	0.3818	0.154	0.140	0.130	0.129	0.112	0.085	0.076	0.118	0.028	0.154	0.076
U197	66	LAB C	p-Benzoquinone	500.000	0.000	40.460	22.931	11.139	7.991	4.119	3.850	2.343	8.092	4.586	2.228	1.598	0.824	0.770	0.469	2.652	2.680	8.092	0.469
U197	66	LAB D	p-Benzoquinone	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U197	66	LAB E	p-Benzoquinone	500.000		99.780	97.919	92.903	86.562	73.652	73.576	50.428	19.956	19.584	18.581	17.312	14.730	14.715	10.086	16.423	3.240	19.956	10.086
U197	66	LAB F	p-Benzoquinone	500.000		11.141	8.327	7.299	5.551	5.503	5.261	3.768	2.228	1.665	1.460	1.110	1.101	1.052	0.754	1.339	0.464	2.228	0.754
U039	70	LAB A	p-Chloro-m-cresol	1.000	0.000	1.458	1.331	0.893	0.880	0.807	0.581	0.293	145.800	133.100	89.300	88.000	80.700	58.100	29.300	89.186	38.346	145.800	29.300
U039	70	LAB B	p-Chloro-m-cresol	1.000		2.2610	1.8178	0.9410	0.8817	0.8453	0.7873	0.6385	226.100	181.780	94.100	88.170	84.530	78.730	63.850	116.751	57.208	226.100	63.850
U039	70	LAB C	p-Chloro-m-cresol	1.000	0.000	7.984	7.428	7.407	7.383	7.375	4.488	0.000	798.400	742.800	740.700	738.300	737.500	448.800	0.000	600.929	287.317	798.400	0.000
U039	70	LAB D	p-Chloro-m-cresol	1.000		1.145	1.095	1.052	1.041	1.001	0.909	0.903	114.500	109.500	105.200	104.100	100.100	90.900	90.300	102.086	8.374	114.500	90.300
U039	70	LAB E	p-Chloro-m-cresol	1.000	0.000	4.472	4.440	4.216	4.096	3.999	3.210	2.970	447.200	444.000	421.600	409.600	399.900	321.000	297.000	391.471	57.102	447.200	297.000
U039	70	LAB F	p-Chloro-m-cresol	1.000		5.461	5.039	4.659	4.611	4.362	4.363	4.356	546.100	503.900	465.900	461.100	436.200	436.300	435.600	469.300	39.097	546.100	435.600
P024	74	LAB A	p-Chloroaniline	20.000	0.000	8.070	8.064	7.506	7.345	6.244	5.972	3.763	40.350	40.320	37.530	36.725	31.220	29.860	18.815	33.546	7.113	40.350	18.815
P024	74	LAB B	p-Chloroaniline	20.000		76.8693	70.2858	69.9600	66.9507	66.7830	62.9974	60.3707	384.347	351.429	349.800	334.754	333.915	314.987	301.854	338.727	26.161	384.347	301.854
P024	74	LAB C	p-Chloroaniline	20.000	0.000	8.382	7.917	6.753	5.898	5.576	3.730	3.492	41.910	39.585	33.765	29.490	27.880	18.650	17.460	29.677	8.703	41.910	17.460
P024	74	LAB D	p-Chloroaniline	20.000		6.481	4.582	4.417	4.194	1.385	1.282	0.269	32.405	22.910	22.085	20.970	6.925	6.410	1.345	16.150	10.471	32.405	1.345
P024	74	LAB E	p-Chloroaniline	20.000		11.907	9.623	9.257	9.151	8.042	5.877	4.891	59.535	48.115	46.285	45.755	40.210	29.385	24.455	41.820	11.171	59.535	24.455
P024	74	LAB F	p-Chloroaniline	20.000		12.120	11.461	11.295	11.172	9.047	6.404	3.552	60.600	57.305	56.475	55.860	45.235	32.020	17.760	46.465	14.832	60.600	17.760
U052	82	LAB A	p-Cresol	1.000	0.000	1.041	1.006	0.969	0.950	0.635	0.543	0.214	104.100	100.600	96.900	95.000	63.500	54.300	21.400	76.543	29.053	104.100	21.400
U052	82	LAB B	p-Cresol	1.000		1.1640	0.9509	0.8880	0.8724	0.8303	0.8181	0.7717	116.400	95.090	88.800	87.240	83.030	81.810	77.170	89.934	12.806	116.400	77.170
U052	82	LAB C	p-Cresol	1.000	0.000	1.500	1.055	0.958	0.896	0.894	0.897	0.708	150.000	105.500	95.800	89.600	89.400	89.700	70.800	98.686	26.202	150.000	70.800
U052	82	LAB D	p-Cresol	1.000		1.198	1.118	1.103	0.994	0.981	0.884	0.819	119.800	111.800	110.300	99.400	98.100	88.400	81.900	101.386	13.104	119.800	81.900
U052	82	LAB E	p-Cresol	1.000	0.000	0.898	0.815	0.797	0.780	0.776	0.732	0.698	89.800	81.500	79.700	78.000	77.600	73.200	69.800	78.514	6.024	89.800	69.800
U052	82	LAB F	p-Cresol	1.000		1.120	0.989	0.967	0.935	0.906	0.830	0.677	112.000	98.900	96.700	93.500	90.600	83.000	67.700	91.771	12.503	112.000	67.700

TABLE 2 SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
MIVOLATILE ORGANICS																							
093	94	LAB A	p-Dimethylaminoazobenzene	4.000	0.000	2.640	1.510	1.283	1.261	1.256	1.179	0.949	66.000	37.750	32.075	31.525	31.400	29.475	23.725	35.993	12.831	66.000	23.725
093	94	LAB B	p-Dimethylaminoazobenzene	4.000		8.8021	5.9332	5.8246	4.1001	3.3820	3.1896	1.9805	220.053	148.330	145.615	102.503	84.550	79.740	49.513	118.615	62.030	220.053	49.513
093	94	LAB C	p-Dimethylaminoazobenzene	4.000	0.000	4.409	1.389	1.183	1.126	1.076	1.060	0.932	110.225	34.725	29.575	28.150	26.900	26.500	23.300	39.911	30.074	110.225	23.300
093	94	LAB D	p-Dimethylaminoazobenzene	4.000		5.579	5.379	5.299	5.251	5.000	4.885	4.094	139.475	134.475	132.475	131.275	125.000	122.125	102.350	126.739	11.295	139.475	102.350
093	94	LAB E	p-Dimethylaminoazobenzene	4.000		7.351	7.100	6.750	6.437	3.488	3.323	3.254	183.775	177.500	168.750	160.925	87.200	83.075	81.350	134.654	44.490	183.775	81.350
093	94	LAB F	p-Dimethylaminoazobenzene	4.000		30.013	26.827	23.605	20.603	20.011	19.319	16.700	750.325	670.675	590.125	515.075	500.275	482.975	417.500	560.993	109.099	750.325	417.500
077	125	LAB A	p-Nitroaniline	20.000	0.000	16.885	12.701	12.162	11.210	8.611	5.964	0.482	84.425	63.505	60.810	56.050	43.055	29.820	2.410	48.582	24.866	84.425	2.410
077	125	LAB B	p-Nitroaniline	20.000		0.3812	0.0479	0.0349	0.0331	0.0312	0.0210	0.0194	1.906	0.240	0.175	0.166	0.156	0.105	0.097	0.407	0.614	1.906	0.097
077	125	LAB C	p-Nitroaniline	20.000	0.000	22.090	21.786	19.208	19.114	18.849	13.109	1.352	110.450	108.930	96.040	95.570	94.245	65.545	6.760	82.506	33.797	110.450	6.760
077	125	LAB D	p-Nitroaniline	20.000		15.428	14.655	14.584	14.073	12.988	12.629	10.457	77.140	73.275	72.920	70.365	64.939	63.145	52.285	67.651	7.795	77.140	52.285
077	125	LAB E	p-Nitroaniline	20.000		14.662	13.052	11.982	11.938	11.704	11.280	11.090	73.310	65.260	59.910	59.690	58.520	56.400	55.450	61.220	6.220	73.310	55.450
077	125	LAB F	p-Nitroaniline	20.000		16.497	16.481	15.163	14.946	13.168	13.031	0.151	82.485	82.405	75.815	74.730	65.840	65.155	0.755	63.884	28.945	82.485	0.755
183	136	LAB A	Pentachlorobenzene	4.000	0.000	3.803	3.763	3.568	3.339	3.252	3.169	1.403	95.075	94.075	89.200	83.475	81.300	79.225	35.075	79.632	19.980	95.075	35.075
183	136	LAB B	Pentachlorobenzene	4.000		4.2607	4.1430	3.7045	3.5732	3.4871	3.2900	3.1657	106.518	103.575	92.613	89.330	87.178	82.250	79.143	91.515	9.622	106.518	79.143
183	136	LAB C	Pentachlorobenzene	4.000	0.000	5.002	4.847	4.745	4.742	4.673	4.656	4.494	125.050	121.175	118.625	118.550	116.825	116.400	112.350	118.425	3.985	125.050	112.350
183	136	LAB D	Pentachlorobenzene	4.000		4.235	4.179	4.044	4.035	3.777	3.738	3.604	105.875	104.475	101.100	100.875	94.425	93.450	90.100	98.614	5.963	105.875	90.100
183	136	LAB E	Pentachlorobenzene	4.000		5.472	5.304	5.259	5.102	5.083	4.221	4.143	136.800	132.600	131.475	127.550	127.075	105.525	103.575	123.514	12.719	136.800	103.575
183	136	LAB F	Pentachlorobenzene	4.000		3.479	3.114	2.922	2.880	2.871	2.834	2.737	86.975	77.850	73.050	72.000	71.775	70.850	68.425	74.418	5.767	86.975	68.425
184	137	LAB A	Pentachloroethane	100.000	0.000	27.537	21.886	20.629	20.235	18.190	18.137	11.294	27.537	21.886	20.629	20.235	18.190	18.137	11.294	19.701	4.515	27.537	11.294
184	137	LAB B	Pentachloroethane	100.000		40.4482	37.3051	36.7100	33.8492	33.7125	32.0070	31.8250	40.448	37.305	36.710	33.849	33.713	32.007	31.825	35.123	2.962	40.448	31.825
184	137	LAB C	Pentachloroethane	100.000	0.000	109.199	105.544	104.060	94.400	87.200	83.990	48.994	109.199	105.544	104.060	94.400	87.200	83.990	48.994	89.790	19.330	109.199	48.994
184	137	LAB D	Pentachloroethane	100.000		70.095	67.400	66.405	64.709	64.229	62.979	61.647	70.095	67.400	66.405	64.709	64.229	62.979	61.647	65.223	2.909	70.095	61.647
184	137	LAB E	Pentachloroethane	100.000		50.847	49.440	49.171	49.153	44.752	43.732	43.679	50.847	49.440	49.171	49.153	44.752	43.732	43.679	47.245	2.952	50.847	43.679
184	137	LAB F	Pentachloroethane	100.000		60.963	54.636	52.846	52.315	47.635	43.623	30.341	60.963	54.636	52.846	52.315	47.635	43.623	30.341	50.066	9.674	60.963	30.341
185	138	LAB A	Pentachloronitrobenzene	0.400	0.000	2.155	2.135	2.107	2.004	1.552	1.373	0.749	538.750	533.750	526.750	501.000	388.000	343.250	187.250	431.250	122.690	538.750	187.250
185	138	LAB B	Pentachloronitrobenzene	0.400		0.4253	0.3592	0.3387	0.3322	0.3035	0.2890	0.2761	106.325	89.800	84.675	83.050	75.875	72.250	69.025	83.000	11.670	106.325	69.025
185	138	LAB C	Pentachloronitrobenzene	0.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
185	138	LAB D	Pentachloronitrobenzene	0.400		2.224	0.291	0.290	0.255	0.221	0.214	0.184	556.000	72.750	72.500	63.750	55.250	53.500	46.000	131.393	173.589	556.000	46.000
185	138	LAB E	Pentachloronitrobenzene	0.400		0.371	0.348	0.345	0.335	0.297	0.292	0.248	92.750	87.000	86.250	83.750	74.250	73.000	62.000	79.857	9.730	92.750	62.000
185	138	LAB F	Pentachloronitrobenzene	0.400		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	139	LAB A	Pentachlorophenol	100.000	0.000	40.358	35.450	19.077	19.065	19.304	19.125	0.297	40.358	35.450	19.077	19.065	19.304	19.125	0.297	22.751	10.640	40.358	0.297
	139	LAB B	Pentachlorophenol	100.000		20.0070	16.5348	12.0185	11.4183	11.2870	9.4918	9.0622	20.007	16.535	12.019	11.418	11.287	9.492	9.062	12.920	3.687	20.007	9.062
	139	LAB C	Pentachlorophenol	100.000	0.000	113.894	54.179	50.886	49.252	43.537	29.882	22.725	113.894	54.179	50.886	49.252	43.537	29.882	22.725	52.051	27.443	113.894	22.725
	139	LAB D	Pentachlorophenol	100.000		78.400	65.207	57.894	38.194	36.969	36.182	31.170	78.400	65.207	57.894	38.194	36.969	36.182	31.170	49.145	16.719	78.400	31.170
	139	LAB E	Pentachlorophenol	100.000		49.934	47.290	46.467	46.294	44.101	37.110	29.220	49.934	47.290	46.467	46.294	44.101	37.110	29.220	42.917	6.709	49.934	29.220
	139	LAB F	Pentachlorophenol	100.000		11.514	10.090	9.617	8.830	8.265	7.573	7.205	11.514	10.090	9.617	8.830	8.265	7.573	7.205	9.022	1.382	11.514	7.205
187	140	LAB A	Phenacetin	2.000	0.000	2.188	2.140	0.993	0.990	0.965	0.929	0.460	109.400	107.000	49.650	49.500	48.250	46.450	23.000	61.893	30.549	109.400	23.000
187	140	LAB B	Phenacetin	2.000		0.9432	0.7888	0.6362	0.6264	0.5779	0.5489	0.5422	47.160	39.440	31.810	31.320	28.895	27.445	27.110	33.311	6.945	47.160	27.110
187	140	LAB C	Phenacetin	2.000	0.000	1.865	1.821	1.608	1.515	1.469	1.467	1.182	93.250	91.050	80.400	75.750	73.450	73.350	59.100	78.050	10.770	93.250	59.100
187	140	LAB D	Phenacetin	2.000		1.663	1.621	1.480	1.350	1.070	0.984	0.964	83.150	81.050	74.000	67.500	53.500	49.200	48.200	65.229	15.050	83.150	48.200
187	140	LAB E	Phenacetin	2.000		1.419	1.354	1.280	1.242	1.225	1.189	1.111	70.950	67.700	64.000	62.100	61.250	59.450	55.550	63.000	4.707	70.950	55.550
187	140	LAB F	Phenacetin	2.000		37.751	37.394	29.323	27.004	26.974	25.405	25.273	1887.550	1869.700	1466.150	1350.200	1348.700	1270.250	1263.650	1493.743	250.077	1887.550	1263.650
	141	LAB A	Phenanthrene	20.000	0.280	18.330	14.871	14.964	13.900	12.925	7.060	6.577	90.523	73.021	73.294	68.092	63.240	34.763	32.431	62.195	17.954	90.523	32.431
	141	LAB B	Phenanthrene	20.000		18.3282	16.9253	15.9686	13.7083	13.7587	13.7091	12.9125	91.641	84.627	79.843	68.542	68.794	68.546	64.563	75.222	9.460	91.641	64.563
	141	LAB C	Phenanthrene	20.000	0.270	29.748	25.082	22.717	22.603	22.270	22.250	15.440	146.740	123.841	112.072	111.665	110.000	109.900	76.172	112.001	19.205	146.740	76.172
	141	LAB D	Phenanthrene	20.000		21.599	19.337	18.736	18.265	18.168	18.009	17.864	107.995	96.685	93.680	91.325	90.840	90.045	89.320	94.270	6.364	107.995	89.320
	141	LAB E	Phenanthrene	20.000		19.518	17.112	17.014	16.579	15.187	15.047	13.927	97.590	85.560	85.070	82.895	75.935	75.235	69.635	81.703	8.459	97.590	69.635
	141	LAB F	Phenanthrene	20.000	0.072	14.894	14.888	14.884	14.723	14.577	14.215	12.548	74.203	74.053	74.063	73.261	72.624	70.820	62.616	71.661	3.893	74.203	62.616
188	142	LAB A	Phenol	0.200	0.000	1.392	1.230	0.730	0.554	0.541	0.470	0.296	696.000	615.000	365.000	277.000	270.500	235.000	148.000	372.357	190.867	696.000	148.000
188	142	LAB B	Phenol	0.200		0.7359	0.4394	0.4277	0.3426	0.3392	0.1773	0.0040	367.950	219.700	213.850	171.300	169.600	88.650	2.000	176.150	108.065	367.950	2.000
188	142	LAB C	Phenol	0.200	0.240	3.516	3.324	3.010	5.590	4.995	4.738	2.370	1490.900	1437.273	1365.900	1280.182	1112.500	1070.818	530.636	1152.080	298.942	1490.900	530.636
188	142	LAB D	Phenol	0.200		0.821	0.372	0.367	0.342	0.341	0.322	0.322	410.500	186.000	183.500	171.000	170.500	161.000	161.000	206.214	83.009	410.500	161.000
188	142	LAB E	Phenol	0.200		1.737	1.713	1.654	1.583	1.453	1.372	0.000	868.500	856.500	827.000	791.500	726.500	686.000	0.000	679.429	294.183	868.500	0.000
188	142	LAB F	Phenol	0.200		1.009	0.906	0.386	0.353	0.353	0.297	0.178	504.500	453.000	193.000	176.500	176.500	148.500	89.000	248.714	149.491	504.500	89.000
192	144	LAB A	Pronamide	2.000	0.000	1.061	1.045	1.012	0.962	0.919	0.822	0.452	53.050	52.250	50.600	48.100	45.950	41.100	22.600	44.807	9.827	53.050	22.600
192	144	LAB B	Pronamide	2.000		1.2005	1.1570	1.1530	0.9753	0.9633	0.7782	0.7515	60.025	57.850	57.650	48.765	48.165	38.910	37.575	49.849	8.138	60.025	37.575

TABLE 2-SUMMARY OF RECOVERY VALUES FOR HWTC STUDY

Waste Code	BDAT #	Laboratory	Constituent	SPIKE	UNSPIKED ASH	SAMP 1	SAMP 2	SAMP 3	SAMP 4	SAMP 5	SAMP 6	SAMP 7	PERCENT RECOVERY SAMP 1	PERCENT RECOVERY SAMP 2	PERCENT RECOVERY SAMP 3	PERCENT RECOVERY SAMP 4	PERCENT RECOVERY SAMP 5	PERCENT RECOVERY SAMP 6	PERCENT RECOVERY SAMP 7	AVERAGE PERCENT RECOVERY	STAND DEV.	HIGHEST PERCENT RECOVERY	LOWEST PERCENT RECOVERY
SEMIVOLATILE ORGANICS																							
U192	144	LAB C	Pronamide	2.000	0.000	1.961	1.655	1.617	1.553	1.548	1.506	1.688	98.050	82.750	80.850	77.650	77.400	75.300	84.400	79.071	11.022	98.050	84.400
U192	144	LAB D	Pronamide	2.000		1.308	1.323	1.295	1.233	1.229	1.218	1.138	65.400	66.150	64.750	61.650	61.450	60.900	56.900	62.914	3.040	65.400	56.900
U192	144	LAB E	Pronamide	2.000		9.405	1.282	1.250	1.202	1.100	0.987	0.928	470.250	64.100	62.500	60.100	55.000	49.350	46.400	115.306	145.002	470.250	46.400
U192	144	LAB F	Pronamide	2.000		1.011	1.009	0.917	0.900	0.829	0.813	0.808	50.550	50.450	45.850	45.000	41.450	40.650	40.400	44.907	4.033	50.550	40.400
	145	LAB A	Pyrene	2.000	0.000	4.855	4.352	2.682	2.647	2.643	2.608	0.887	242.750	217.600	134.100	132.350	132.150	130.400	44.350	147.743	60.416	242.750	44.350
	145	LAB B	Pyrene	2.000		7.0021	6.2030	5.6631	3.9340	3.7146	3.5530	1.7445	350.105	310.150	283.155	196.700	185.730	177.650	87.225	229.966	96.648	350.105	87.225
	145	LAB C	Pyrene	2.000	0.100	7.880	2.103	2.076	1.910	1.820	1.800	1.733	389.077	100.005	98.512	90.637	84.851	84.093	80.005	128.897	97.410	389.077	80.005
	145	LAB D	Pyrene	2.000		5.274	4.446	4.409	4.373	4.283	4.172	3.283	263.700	222.300	220.450	218.650	214.150	208.600	164.150	218.904	28.023	263.700	164.150
	145	LAB E	Pyrene	2.000		8.169	4.689	4.600	3.994	0.973	0.944	0.778	408.450	234.450	230.000	199.700	48.650	47.200	38.900	172.479	128.742	408.450	38.900
	145	LAB F	Pyrene	2.000	0.030	20.003	16.616	15.403	15.261	11.172	11.066	9.518	998.365	826.933	766.532	749.558	546.723	546.717	474.400	697.474	176.131	998.365	474.400
	39	LAB A	Pyridine	4.000	0.000	2.515	2.131	1.925	1.732	1.708	1.558	0.644	62.875	53.275	48.125	43.300	42.700	38.950	16.100	43.618	13.337	62.875	16.100
	39	LAB B	Pyridine	4.000		5.1987	5.0969	4.4805	3.7448	2.3869	1.9487	1.1245	129.968	127.423	112.013	93.620	59.672	48.718	28.113	85.647	37.736	129.968	28.113
	39	LAB C	Pyridine	4.000	0.000	5.207	4.869	4.731	4.365	3.605	0.820	0.000	130.175	121.725	118.275	109.125	90.125	20.500	0.000	84.275	48.531	130.175	0.000
	39	LAB D	Pyridine	4.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	39	LAB E	Pyridine	4.000		0.270	0.267	0.265	0.260	0.252	0.224	0.106	6.750	6.675	6.625	6.500	6.300	5.600	2.650	5.871	1.364	6.750	2.650
	39	LAB F	Pyridine	4.000		0.469	0.420	0.355	0.335	0.310	0.307	0.000	11.725	10.500	8.875	8.375	7.750	7.675	17.910	10.400	3.632	7.750	17.910
U201	146	LAB A	Resorcinol	500.000	0.000	136.291	106.741	76.551	72.974	72.362	60.302	7.167	27.258	21.348	15.310	14.595	14.470	12.060	1.433	15.212	7.401	27.258	1.433
U201	146	LAB B	Resorcinol	500.000		240.7986	160.3420	102.2910	102.1630	67.6248	40.5838	33.0555	48.160	32.068	20.458	20.433	13.525	8.117	6.611	21.339	13.569	48.160	6.611
U201	146	LAB C	Resorcinol	500.000	0.000	201.250	179.928	138.222	132.920	125.452	121.891	121.093	40.250	35.986	27.644	26.584	25.090	24.378	24.219	29.166	6.067	40.250	24.210
U201	146	LAB D	Resorcinol	500.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
U201	146	LAB E	Resorcinol	500.000		261.419	241.779	225.310	206.450	199.153	199.150	72.428	52.284	48.356	45.062	41.290	39.831	39.830	14.486	40.162	11.232	52.284	14.486
U201	146	LAB F	Resorcinol	500.000		7.316	6.555	6.376	6.311	2.724	2.310	1.230	1.463	1.311	1.275	1.262	0.545	0.462	0.246	0.938	0.482	1.463	0.246
U203	147	LAB A	Safrole	2.000	0.000	1.646	1.624	1.601	1.582	1.500	1.399	0.732	82.300	81.200	80.050	79.100	75.000	69.950	36.600	72.029	14.987	82.300	36.600
U203	147	LAB B	Safrole	2.000		1.4911	1.3688	1.3637	1.3514	1.3165	1.3077	1.2009	74.555	68.440	68.185	67.570	65.825	65.385	60.045	67.096	3.013	74.555	60.045
U203	147	LAB C	Safrole	2.000	0.000	1.908	1.901	1.835	1.818	1.805	1.713	1.582	95.400	95.050	91.750	90.900	90.250	85.650	79.100	89.693	5.565	95.400	79.100
U203	147	LAB D	Safrole	2.000		2.011	1.895	1.872	1.862	1.853	1.818	1.788	100.550	94.750	93.600	93.100	92.650	90.900	89.400	93.564	3.268	100.550	89.400
U203	147	LAB E	Safrole	2.000		1.810	1.769	1.669	1.492	1.469	1.419	1.281	90.500	88.450	83.450	74.600	73.450	70.950	64.050	77.036	8.729	90.500	64.050
U203	147	LAB F	Safrole	2.000		1.138	1.082	1.022	1.006	1.003	0.990	0.000	56.900	54.100	51.100	50.300	50.150	49.500	0.000	44.579	18.262	56.900	0.000
	183	LAB A	Tris-(2,3-dibromopropyl)phosphate	100.000	0.000																		
	183	LAB B	Tris-(2,3-dibromopropyl)phosphate	100.000		11.0747	10.1413	0.6796	0.3940	0.1174	0.0817	3.4566	11.075	10.141	0.680	0.394	0.117	0.082	3.457	3.278	2.637	11.075	3.457
	183	LAB C	Tris-(2,3-dibromopropyl)phosphate	100.000	0.000	10.255	11.047	0.062	0.000	0.000	0.000	0.000	10.255	11.047	0.062	0.000	0.000	0.000	0.000	4.766	0.141	10.255	0.000
	183	LAB D	Tris-(2,3-dibromopropyl)phosphate	100.000		72.175	61.288	57.343	54.270	38.497	22.304	10.679	72.175	61.288	57.343	54.270	38.497	22.304	10.679	46.300	18.818	72.175	10.679
	183	LAB E	Tris-(2,3-dibromopropyl)phosphate	100.000									0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	183	LAB F	Tris-(2,3-dibromopropyl)phosphate	100.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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Table 3. Summary of Volatile and Semivolatile BDAT Volatile and Semivolatile Organic Constituents for Which Numerical Standards Were Proposed for U and P Waste Codes or Multisource Leachates and Those Identified as Potential Problems by the HWTC Study or EPA's Study 36

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study recovery value problems	HWTC's study: quantitatively discussed as problem analyte
	Volatile organics							
222.	Acetone	67-64-1	X	X		X		X
1.	Acetonitrile	75-05-8	X	X		X	X	X
2.	Acrolein	107-02-8	X				X	X
3.	Acrylonitrile	107-13-1	X	X		X		X
4.	Benzene	71-43-2	X	X				
5.	Bromodichloromethane	75-27-4	X					
6.	Bromomethane	74-83-9	X	X				
223.	n-Butyl alcohol n-Butanol	71-36-3	X	X				
7.	Carbon tetrachloride	56-23-5	X	X				
8.	Carbon disulfide	75-15-0						
9.	Chlorobenzene	108-90-7	X	X				
10.	2-Chloro-1,3-butadiene	126-99-8	X				X	X
11.	Chlorodibromomethane	124-48-1	X					
12.	Chloroethane	75-00-3	X					X
13.	2-Chloroethyl vinyl ether	110-75-8				X	X	X
14.	Chloroform	67-66-3	X	X				
15.	Chloromethane	74-87-3	X	X			X	X
16.	3-Chloropropene	107-05-1	X					
17.	1,2-Dibromo-3-chloropropane	96-12-8	X	X				X
18.	1,2-Dibromoethane	106-93-4	X	X				
19.	Dibromomethane	74-95-3	X	X				
20.	trans-1,4-Dichloro-2-butene	110-57-6		X			X	X
21.	Dichlorodifluoromethane	75-71-8	X	X			X	X
22.	1,1-Dichloroethane	75-34-3	X	X				
23.	1,2-Dichloroethane	107-06-2	X	X				
24.	1,1-Dichloroethylene	75-35-4	X	X				

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
25.	trans-1,2-Dichloroethene	156-60-5	X	X				
26.	1,2-Dichloropropane	78-87-5		X				
27.	trans-1,3-Dichloropropene	10061-02-6	X	X				
28.	cis-1,3-Dichloropropene	10061-01-5	X	X				
29.	1,4-Dioxane	123-91-1	X	X				X
224.	Deleted (2-ethoxy ethanol)	--						
225.	Ethyl acetate	141-78-6	X	X		X		
226.	Ethyl benzene	100-41-4	X					
30.	Ethyl cyanide	107-12-0	X	X				X
227.	Ethyl ether	60-29-7	X	X				X
31.	Ethyl methacrylate	97-63-2	X	X				
214.	Ethylene oxide	75-21-8						
32.	Iodomethane	74-88-4	X	X				
33.	Isobutyl alcohol	78-83-1	X	X				
228.	Methanol	67-56-1	X					
34.	Methyl ethyl ketone	78-93-3	X	X				X
229.	Methyl isobutyl ketone	108-10-1	X	X				
35.	Methyl methacrylate	80-62-6	X	X				
37.	Methacrylonitrile	126-98-7	X	X				X
38.	Methylene chloride	75-09-2	X	X				X
230.	Deleted (2-Nitropropane)	--				X	X	X
39.	Pyridine	110-86-1	X	X				
40.	1,1,1,2-Tetrachloroethane	630-20-6	X	X				
41.	1,1,2,2-Tetrachloroethane	79-34-6	X	X				
42.	Tetrachloroethene	127-18-4	X	X				
43.	Toluene	108-88-3	X	X				
44.	Tribromomethane (Bromoform)	75-25-2	X	X				
45.	1,1,1-Trichloroethane	71-55-6	X	X				
46.	1,1,2-Trichloroethane	79-00-5	X	X				

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
47.	Trichloroethene	79-01-6	X	X				
48.	Trichloromonofluoromethane	75-69-4	X	X				
49.	1,2,3-Trichloropropane	96-18-4	X					
231.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1 -	X					
50.	Vinyl chloride	75-01-4	X	X		X		X
215.	1,2-Xylene	97-47-6	X	X				
216.	1,3-Xylene	108-38-3	X	X				
217.	1,4-Xylene	106-44-5	X	X				
	Semivolatile organics							
51.	Acenaphthalene	208-96-8	X					
52.	Acenaphthene	83-32-9	X					
53.	Acetophenone	96-86-2	X	X		X		
233.	Acrylamide	79-06-1	X					
54.	2-Acetylaminofluorene	53-96-3	X	X				
55.	4-Aminobiphenyl	92-67-1	X				X	X
56.	Aniline	62-53-3	X	X			X	X
57.	Anthracene	120-12-7	X					
58.	Aramite	140-57-8	X		X		X	X
59.	Benz(a)anthracene	56-55-3	X	X		X		
218.	Benzal chloride	98-87-3	X	X				
60.	Benzenethiol	108-98-5	X		X			X
61.	Deleted (Benzidine)	--				X	X	X
62.	Benzo(a)pyrene	50-32-8	X	X				X
63.	Benzo(b)fluoranthene	205-99-2	X					
64.	Benzo(ghi)perylene	191-24-2	X					X
65.	Benzo(k)fluoranthene	207-08-9	X					X

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
66.	p. Benzoquinone	106-51-4	X	X	X		X	X
67.	Bis(2-chloroethoxy)methane	111-91-1	X	X		X		
68.	Bis(2-chloroethyl)ether	111-44-4	X	X				
69.	Bis(2-chloroisopropyl)ether	39638-32-9	X	X				
70.	Bis(2-ethylhexyl)phthalate	117-81-7	X					
71.	4-Bromophenyl phenyl ether	101-55-3	X	X				
72.	Butyl benzyl phthalate	85-68-7	X					
73.	2-sec-Butyl-4,6-dinitrophenol	88-85-7	X	X		X	X	X
74.	p-Chloroaniline	106-47-8	X	X				
75.	Chlorobenzilate	510-15-6	X	X		X	X	
76.	p-Chloro-m-cresol	59-50-7	X	X				X
77.	2-Chloronaphthalene	91-58-7	X	X				
78.	2-Chlorophenol	95-57-8	X	X				
79.	Deleted 3-Chloropropionitrile	--					X	
80.	Chrysene	218-01-9	X	X		X		
81.	ortho-Cresol	95-48-7	X	X				
82.	para-Cresol (m&p)	106-44-5	X	X				
232.	Cyclohexanone	108-94-1	X	X		X		X
83.	Dibenz(a,h)anthracene	53-70-3	X	X		X	X	
84.	Dibenzo(a,e)pyrene	192-65-4			X		X	X
85.	Dibenzo(a,i)pyrene	189-55-9	X		X		X	X
86.	m-Dichlorobenzene	541-73-1	X	X				
87.	o-Dichlorobenzene	95-50-1	X	X				
88.	p-Dichlorobenzene	106-46-7	X	X				
89.	3,3'-Dichlorobenzidine	91-94-1	X	X		X		X

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
90.	2,4-Dichlorophenol	120-83-2	X	X				
91.	2,6-Dichlorophenol	87-65-0	X	X				
92.	Diethyl phthalate	84-66-2	X					
93.	3,3'-Dimethoxybenzidine	119-90-4				X	X	X
94.	p-Dimethylaminoazobenzene	60-11-7	X	X		X		
95.	3,3'-Dimethylbenzidine	119-93-7					X	X
96.	2,4-Dimethylphenol	105-67-9	X	X				
97.	Dimethyl phthalate	131-11-3	X					
98.	Di-n-butyl phthalate	84-74-2	X					
99.	1,4-Dinitrobenzene	100-25-4	X					
100.	4,6-Dinitro-o-cresol	534-52-1	X	X			X	X
101.	2,4-Dinitrophenol	51-28-5	X	X			X	X
102.	2,4-Dinitrotoluene	121-14-2	X	X				
103.	2,6-Dinitrotoluene	606-20-2	X	X				
104.	Di-n-octyl phthalate	117-84-0	X					
105.	Di-n-propylnitrosamine	621-64-7	X	X			X	
106.	Diphenylamine	122-39-4	X					X
219.	Diphenylnitrosamine	86-30-6	X					
234.	cis-1,4-Dichloro-2-butene	764-41-0	X	X				
107.	1,2-Diphenylhydrazine	122-66-7						X
108.	Fluoranthene	206-44-0	X	X		X		
109.	Fluorene	86-73-7	X					
110.	Hexachlorobenzene	118-74-1	X	X				
111.	Hexachlorobutadiene	87-68-3	X	X				
112.	Hexachlorocyclopentadiene	77-47-4	X	X	X	X	X	X
113.	Hexachloroethane	67-72-1	X	X				
114.	Hexachlorophene	70-30-4	X	X	X	X	X	X
115.	Hexachloropropene	1888-71-7	X	X		X	X	

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
116.	Indeno(1,2,3-cd)pyrene	193-39-5	X	X				
117.	Isosafrole	120-58-1	X	X		X	X	X
118.	Methapyrilene	91-80-5	X	X			X	X
119.	3-Methylcholanthrene	56-49-5	X	X			X	X
120.	4,4'-Methylenebis (2-chloroaniline)	101-14-4	X	X				
36.	Methyl methanesulfonate	66-27-3						
121.	Naphthalene	91-20-3	X	X			X	
122.	1,4-Naphthoquinone	130-15-4	X	X	X			
123.	1-Naphthylamine	134-32-7	X	X	X	X	X	X
124.	2-Naphthylamine	91-59-8	X	X		X	X	X
125.	p-Nitroaniline	100-01-6	X	X				
126.	Nitrobenzene	98-95-3	X	X		X		
127.	4-Nitrophenol	100-02-7	X	X		X		X
128.	N-Nitrosodi-n-butylamine	924-16-3	X	X				
129.	N-Nitrosodiethylamine	55-18-5	X	X		X		
130.	N-Nitrosodimethylamine	62-75-9	X	X	X			X
131.	N-Nitrosomethylethylamine	10595-95-6	X					
132.	N-Nitrosomorpholine	59-89-2	X					
133.	N-Nitrosopiperidine	100-75-4	X	X				
134.	N-Nitrosopyrrolidine	930-55-2	X	X				
135.	5-Nitro-o-toluidine	99-55-8	X	X		X		
136.	Pentachlorobenzene	608-93-5	X	X				
137.	Pentachloroethane	76-01-7	X	X	X	X		
138.	Pentachloronitrobenzene	82-68-8	X	X			X	X
139.	Pentachlorophenol	87-86-5	X	X				X
140.	Phenacetin	62-44-2	X	X		X		X
141.	Phenanthrene	85-01-8	X	X				
142.	Phenol	108-95-2	X	X			X	

Table 3. (continued)

BDAT ref.	Constituent	CAS no.	Leachate numerical standards proposed	U and P waste code numerical standards proposed	USEPA Method 36 Problem Analytes	HWTC's Study: detection limits greater than proposed standard	HWTC's study: recovery value problems	HWTC's study: qualitatively discussed as problem analyte
220.	Phthalic anhydride	85-44-9	X		X			X
143.	Deleted (2-Picoline)	--						
144.	Pronamide	23950-58-5	X	X		X		
145.	Pyrene	129-00-0	X	X			X	
146.	Resorcinol	108-46-3	X	X	X	X	X	X
147.	Safrole	94-59-7	X	X				X
148.	1,2,4,5-Tetrachlorobenzene	95-94-3	X	X				
149.	2,3,4,6-Tetrachlorophenol	58-90-2	X					X
150.	1,2,4-Trichlorobenzene	120-82-1	X					
151.	2,4,5-Trichlorophenol	95-95-4	X					
152.	2,4,6-Trichlorophenol	88-06-2	X					
153.	Tris(2,3-dibromopropyl) phosphate	126-72-7	X				X	X

Table 4 Summary of the Volatile and Semivolatile Constituents with Promulgated Standards Different Than the Proposed Rule

Changes in Concentration-Based Standards for U and P Waste Codes and for Volatile and Semivolatile Organic Constituents for F039 Nonwastewaters[a]

Code	Constituent
P047	4,6-Dinitro-o-cresol
P048	2,4-Dinitrophenol
U002	Acetone
U004	Acetophenone
U005	2-Acetylaminofluroene
U009	Acrylonitrile
U018	Benz(a)anthracene
U022	Benzo(a)pyrene
U043	Vinyl Chloride
U044	Chloroform
U045	Chloromethane
U050	Chrysene
U051	Naphthalene
U051	Pentachlorophenol
U051	Phenanthrene
U051	Pyrene
U051	Toluene
U051	Xylenes (total)
U063	Dibenz(a,h)anthracene
U075	Dichlorodifluoromethane
U076	1,1-Dichloroethane
U077	1,2-Dichloroethane
U078	1,1-Dichloroethylene
U079	trans-1,2-Dichloroethylene
U080	Methylene chloride
U083	1,2-Dichloropropane
U084	cis-1,3-Dichloropropene
U084	trans-1,3-Dichloropropene
U108	1,4-Dioxane
U112	Ethyl acetate
U117	Ethyl ether
U120	Fluoranthene
U131	Hexachloroethane
U137	Indeno(1,2,3-c,d)pyrene
U157	3-Methylcholanthrene

Table 4 (continued)

Code	Constituent
U158	4,4'-Methylenebis (2-chloroaniline)
U159	Methyl ethyl ketone
U165	Naphthalene
U170	4-Nitrophenol
U172	N-Nitrosodi-n-butylamine
U179	N-Nitroso-piperidine
U180	N-Nitroso-pyrrolidine
U181	5-Nitro-o-toluidine
U208	1,1,1,2-Tetrachloroethane
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethene
U211	Carbon tetrachloride
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U239	Xylenes (total)
U243	Hexachloropropene
F039	Acenaphthene
F039	Anthracene
F039	Benzo(g,h,i)perylene
F039	Bromodichloro methane
F039	Butyl benzl phthalate
F039	Chlorodibromomethane
F039	Fluorene

[a] The changes in concentration-based standards occurred because:

(1) EPA decided not to base concentration-based standards for U and P nonwastewaters and F039 nonwastewaters on data from three of the fourteen test burns and to recalculate concentration-based standards for promulgation with data from other test burns involving matrices more similar to U and P matrices.

(2) EPA reevaluated the use of recovery factors in calculating concentration-bases standards. EPA had calculated the proposed concentration-based standard for halogenated aliphatics, aromatics, and polynuclear aromatics using an averaged recovery factor from several of the spiked constituents. The standards for the rest of the U wastes were calculated using a recovery factor from a single constituent. To ensure consistency among all concentration-based standards, EPA chose to recalculate the standards using a single constituent recovery factor.

Table 4 (continued)

Changes in Concentration-Based Standards to Technology-Based Standards for U and P Nonwastewaters for Volatile and Semivolatile Organics

Revised for Codes:	Constituent
U003	Acetonitrile
P003	Acrolein
U017	Benzal chloride
U074	1,4-Dichloro-2-butene (cis and trans)
U197	p-Benzoquinone
U038	Chlorobenzilate
U057	Cyclohexanone
U073	3,3'-Dichlorobenzidine
U093	p-Dimethylaminoazobenzene
U130	Hexachlorocyclopentadiene
U132	Hexachlorophene
U166	1,4-Naphthoquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
P082	N-Nitrosodimethylamine
U184	Pentachloroethane
U201	Resorcinol

Table 4 (continued)

Volatile and Semivolatile Organic Constituents for Which Concentration-Based Standards Have Been Dropped for F039 Nonwastewaters

Acetonitrile (U003)
Acrolein (P003)
Acrylamide
4-Aminobiphenyl
2-Chloro-1,3-butadiene
1,4-Dichloro-2-butene (cis and trans) (U074)
Aramite
Benzal chloride (U017)
Benzenethiol
p-Benzoquinone (U197)
Chlorobenzilate (U038)
Cyclohexanone (U057)
Dibenzo(a,e)pyrene
Dibenzo (a,i) pyrene
3,3'-Dichlorobenzidine (U073)
p-Dimethylaminobenzene (U093)
Dilphenylamine
Diphenylnitrosamine
Hexachlorocyclopentadiene (U130)
Hexachlorophene (U132)
Methanol
1,4-Naphthoquinone (U166)
1-Naphthylamine (U167)
2-Naphthylamine (U168)
N-Nitrosodimethylamine (P082)
Pentachloroethane (U184)
Phthalic anhydride
Resorcinol (U201)
Tris(2,3-dibromophosphate)

Comment Number: 1-D-17
Docket Number: LD12-L0247.F
Commenter: HWTC
Issue: General BDAT Aspects
Subissue: PQLs
Comment:

Comprehensive comments were submitted by the HWTC regarding the issue of PQLS. Comments submitted by the Chemical Manufacturing Association (L0007.H) and Chemical Waste Management (00159) concur with our conclusion and recommendations. We feel however that interlaboratory PQLs are more appropriate for a national standard than single laboratory PQLs. EPA should establish matrix specific PQLs on a national basis, rather than allow for potentially thousands of individual laboratory PQLs as proposed by CMA. We concur with the comments made by the State of New Jersey, Department of Environmental Protection, that PQLs should be based on findings of at lease three laboratories to rule out substandard laboratory practices at a single laboratory.

This however, does not preclude the allowance for a site specific treatability variance if an individual company has a unique matrix for which a different PQL is appropriate as opposed to what was used to set BDAT originally. In this case the applicant should provide all of the supporting information to demonstrate why the matrix is different, and should follow all appropriate QA/QC, including strict adherence to the requirements under 40 C.F.R. 136 Appendix B for MDL studies. In addition, confirmation of the PQLs by another laboratory should be encouraged.

The proper matrix specific PQL should be taken into account by EPA in setting BDAT initially. The HWTC interlaboratory study provides PQLs for most of the constituents covered by the third thirds proposed rule. Appendix B to these comments contains a tabulation of each of the Third Third constituents, along with the PQLs determined for nonwastewater by the HWTC interlaboratory study. The HWTC urges EPA to take these PQLs into consideration when finalizing the BDAT standards for the third thirds wastes.

COMMENT NUMBER: 1-D-17
DOCKET NUMBER: LD12-L0247A
COMMENTER: Hazardous Waste Treatment Council
ISSUE: General BDAT Issues
SUBISSUE: PQLs
RESPONSE:

EPA reiterates that PQLs are minimum measures of analytical laboratory performance, as defined in SW-846, for the use of laboratories in assessing their own performance in terms of success in reaching low levels of certain analytes in certain matrices. Outside of this function of providing a quantitative definition of the boundaries between poor and competent analytical performance, PQLs have no regulatory power.

EPA acknowledges the commenters support for establishing matrix-specific PQLs on a national basis instead of allowing for potentially thousands of individual laboratory PQLs. EPA also acknowledges the commenters support that PQLs should be based on findings of at least three laboratories to rule out substandard laboratory practices at a single laboratory.

EPA will take the commenter's concerns into account when developing the guidance on what constitutes "a good faith effort to achieve analytical sensitivity." EPA intends to develop and issue this guidance within the next few months to aid generators, treaters, and regulators in situations where compliance with a standard cannot be demonstrated for a particular waste due to problems with analytical detection limits and where the treatment technology employed was considered by the Agency to be BDAT. The Agency believes that where a waste has been treated with a combustion BDAT process and if the person has made a "good faith effort" to achieve maximum analytical sensitivity, the Agency will consider the person to have demonstrated compliance with the treatment standard.

COMMENT NUMBER: 1-D-17 (continued)

DOCKET NUMBER: LD12-L0247A

COMMENTER: Hazardous Waste Treatment Council

ISSUE: General BDAT Issues

SUBISSUE: PQLs

RESPONSE:

It should be noted that requiring three laboratories to analyze the waste samples and/or the establishment of national PQLs for each waste matrix may place an unnecessary burden on both the regulated and regulatory communities.

The Agency acknowledges the commenter's support for site-specific treatability variances. In the final Third Third rule, the Agency points out that in cases where a facility believes that waste-specific treatment standards cannot be met because their laboratory is still unable to achieve detection limits below the treatment standards on specific treatment residuals, and: (1) the facility complies with all the other conditions mentioned above; or (2) a facility utilizes a combustion technology other than incineration or fuel substitution; or (3) a facility utilizes a noncombustion technology that can be demonstrated to be equivalent, the facility may submit a petition for a variance from the treatment standards for that particular waste code (EPA construes 40 CFR 268.44 as encompassing such petitions). The facility must demonstrate that the analyses are in compliance with all other BDAT QA/QC provisions (as outlined in the BDAT Generic Quality Assurance Project Plan (EPA/530-SW-87-011, March 1987). Moreover, the petitioner must also demonstrate that the treatment process is a well-designed and well-operated BDAT process.

EPA did use the HWTC study to reevaluate the standards that were proposed in the Third Third Rule for U and P nonwastewaters and multi-source leachate nonwastewaters. Changes occurred primarily when EPA

COMMENT NUMBER: 1-D-17 (continued)
DOCKET NUMBER: LD12-L0247A
COMMENTER: Hazardous Waste Treatment Council
ISSUE: General BDAT Issues
SUBISSUE: PQLs
RESPONSE:

reevaluated cases where the HWTC study reported higher detection limits than those used by EPA to calculate standards. Although EPA had generally used the highest of the set of up to 14 incineration ash detection limits as the basis of the proposed standards, some exceptions were made in the case of outliers and where EPA believed a particular raw waste matrix best represented the waste code in question. In reviewing the HWTC study information, EPA reexamined those exceptions where the detection limit fell significantly below HWTC's reported detection limits and where there were anomalously high or low recoveries.

It should be noted that EPA has calculated its treatment standards based on method detection limits and not on PQLs. EPA has published its methodology to calculate treatment standards as the detection limit or concentration level (if detected) times the accuracy correction factor (based on recovery data) times the variability factor. This methodology was published as part of the First and Second Thirds Final Rule. Since the Agency did not receive any substantial comments concerning the methodology used to calculate the treatment standards during the comment period for these Rules, the Agency does not plan to change its methodology for calculating treatment standards. As a result, only information on detection limits and recovery values were evaluated and used to assess the proposed standards. The Agency did not use any information presented in the HWTC study concerning practical quantification limits to recalculate the standards to be promulgated for the U and P waste codes and for multi-source leachate nonwastewaters for the Third Third Rule.

Comment Number: 1-E-1
Docket Number: LD12-00081
Commenter: ENVIROSAFE MANAGEMENT SERVICES, INC.
Issue: GENERAL BDAT ASPECTS
Subissue: WW and Mn WW
Comment:

Page 48382, No. 1.

EPA proposes a definition of wastewaters and non-wastewaters. In this definition, concern is raised as to why we do not have a consistent definition of wastewater for the Land Disposal Restriction programs as well as as for the F001, F002, F003, F004 and F005 solvent water mixtures.

Comment Number: 1-E-1
Docket Number: LD12-
Commenter: Envirosafe Mgmt Services, Inc
Issue: General BDAT Aspects
Subissue: Wastewaters/Nonwastewaters
Response:

The Agency agrees with the commenter on inconsistent definitions for wastewaters and nonwastewaters as well as for F001-F005 wastewaters. Organic solvent wastewaters were originally regulated using TCLP methodology which is not consistent with current standards of using total concentration. At the time the solvents rule was drafted, EPA had not given consideration to the effects of suspended solids on organic treatability; therefore, did not include suspended solids discussion in the definition of wastewaters at the time. EPA has since remediated this definition in subsequent rulemakings by including suspended solids in the wastewater definition. Hence, for new solvents, we are using the current definition of wastewater which includes suspended solids. "Wastewaters are defined as wastes containing less than one percent (weight basis) total suspended solids and less than 1 percent (weight basis) total organic carbon (TOC)," unless otherwise stated.

Comment Number: 1-E-2
Docket Number: LD12-00094
Commenter: Tricil Environmental Services Inc.
Issue: General BDAT Aspects
Subissue: Wastewaters / Nonwastewaters
Comment:

1. U.S. EPA's classification of wastewaters and non-wastewaters.

As proposed by U.S. EPA, most BDAT treatment standards or technologies for a particular waste category are divided between wastewaters and non-wastewaters. Currently, U.S. EPA has defined wastewaters, for purposes of the land ban regulations, as wastes which contain less than 1% total suspended solids and less than 1% organics. TESI is concerned that the use of these classifications for the establishment of BDAT standards for characteristic wastes fails to take into account the broad range and panorama of characteristic wastes. Unlike most listed wastes which are listed according to process of generation or source of generation or by specific chemical name, characteristic wastes can and do result from a wide variety of generation processes. As such, characteristic wastes can and are generated which contain few solids to wastes which are virtually 100% solids. U.S. EPA in its proposed regulation on characteristic wastes appears to have selected data points from a group of "wastewater" treatment studies and a group of data points from "non-wastewater" treatment studies, and then developed differing BDAT limits for each group as though hard and fast wastewater/non-wastewater differences existed in the real world. For example, in regard to cadmium, U.S. EPA is currently proposing a BDAT standard of 0.20 mg/l total composition/24 hour composite sample for wastewaters. For non-wastewaters U.S. EPA is proposing a BDAT standard of 0.14 mg/l TCLP/grab sample. In the discussion justifying the non-wastewater standard, U.S. EPA states that it bases its treatability assumptions upon treatment results from electric arc furnace dust and zinc mining wastes. Both of these materials are virtually 100% solids and treatability studies are probably based upon treatment by flyash ash mixing and stabilization. However, this data is not applicable to a waste which contains 1, 2 or 3% solids, and, during treatment, would behave and be treated more like wastewaters than electric arc furnace dust. Thus, regardless of TESI's other comments regarding the establishment of BDAT limits below characteristic levels, TESI urges U.S. EPA to further divide characteristic wastes into additional categories or broaden the definition of wastewaters.

Comment Number: 1-E-2
Docket Number LD12-00094
Commenter: Tricil Environmental Services
Issue: General BDAT Aspects
Subissue: Wastewaters/Nonwastewaters
Response:

For nonwastewaters, the Agency realizes that in cases where technologies such as stabilization are BDAT some pretreatment may be needed. Concentrated solutions of EP toxic metals, for example, must first be treated by chemical precipitation methods before the formed solids can be recovered and stabilized. For most of the characteristic wastes numerical treatment standards have been established and individual facilities are free to choose treatment sequences to meet these treatment standards.

Comment Number: 1-G-3
Docket Number: LD12-00137
Commenter: USPCI, Inc.
Issue: General BDAT Aspects
Subissue: Wastewater/ Nonwastewaters
Comment:

SWITCHING OF WASTEWATER AND NONWASTEWATER STANDARDS

USPCI understands that the current wastewater/non wastewater treatability groups apply to the waste as it would be applied to the land. We certainly agree that the examples presented in the proposal are improper but we are unable to express this vague concept in unambiguous terms. We suspect that this is because that LDR program is so complex and the impermissible switching concept is so vague.

We are very concerned that this is a "Know it when I think I see it" issue which can be very difficult to defend in a enforcement setting. We urge EPA to not issue any regulation or positive preamble language supporting the concept until the concept can be articulated.

Comment Number: 1-E-3
Docket Number: LD12-00137
Commenter: USPCI Inc
Issue: General BDAT Aspects
Subissue: Wastewaters/Nonwastewaters
Response:

The Agency states, that it is not permissible to dilute or partially treat a waste in order to switch the applicability of a nonwastewater standard to a wastewater standard, or viceversa. There are special circumstances when California list wastes are involved (52 FR 25767. July 8, 1987) when this is possible. The Agency has established this principle because technologies applicable to nonwastewaters are not generally applicable to wastewaters, or require special designs in order to simultaneously handle wastewaters. Furthermore, treatment residues meeting the definition of nonwastewaters must comply with all applicable nonwastewater treatment standards; likewise, residual wastewaters must comply with all applicable wastewater treatment standards.

The Agency recognizes, however, that certain technologies are specifically designed to separate wastewaters from nonwastewaters. Such technologies may or may not be considered partial treatment under this principle.

Comment Number: 1-E-4
Docket Number: LD12-D0179
Commenter: Dow Chemical
Issue: General BDAT Aspects
Subissue: Wastewaters / Non-Wastewaters
Comment:

II. **EPA SHOULD PROVIDE A MORE GENERIC, NARRATIVE DEFINITION FOR WASTEWATERS.**

54 Fed. Reg. 48,383 column 1

EPA has defined wastewater as containing less than 1 percent Total Organic Carbon (TOC) and less than 1 percent Total Suspended Solids (TSS). In determining whether a waste must meet a wastewater or nonwastewater treatment standard and whether impermissible switching between treatability groups has occurred, such a definition can cause serious difficulties. Many waste streams which are treated in surface impoundments may exceed either or both of these criteria, but they are amenable to biological treatment when aggregated with other streams. EPA's prohibition against impermissible switching between treatability groups leaves the owner/operator in a serious quandary.

Rather than setting arbitrary limits on the TOC and TSS levels which define a wastewater, EPA should provide a subjective narrative definition based on handling procedures. Handling for wastewaters and nonwastewaters is very different with wastewaters typically capable of being pumped through pipelines, filtered, phase separated, biologically treated, discharged through an NPDES outfall, etc. Any waste which can be handled as wastewater should be called a wastewater whatever its TOC or TSS concentrations.

Comment Number: 1-E-4
Docket Number: LD12-00179
Commenter: Dow Chemical
Issue: General BDAT Aspects
Subissue: Wastewaters/Nonwastewaters
Response:

The Agency states, that it is not permissible to dilute or partially treat a waste in order to switch the applicability of a nonwastewater standard to a wastewater standard, or viceversa. There are special circumstances when California list wastes are involved (52 FR 25767. July 8, 1987) when this is possible. The Agency has established this principle because technologies applicable to nonwastewaters are not generally applicable to wastewaters, or require special designs in order to simultaneously handle wastewaters. Furthermore, treatment residues meeting the definition of nonwastewaters must comply with all applicable nonwastewater treatment standards; likewise, residual wastewaters must comply with all applicable wastewater treatment standards.

The Agency recognizes, however, that certain technologies are specifically designed to separate wastewaters from nonwastewaters. Such technologies may or may not be considered partial treatment under this principle.

The importance of the TOC level in determining impermissible switching of applicable wastewater or nonwastewater treatment standard is apparent in cases where the waste to be treated contains less than 1% TSS and slightly more than 1 % TOC, and thereby being a nonwastewater by definition. If EPA has established concentration-based treatment standards for the corresponding wastewater form of this waste, it would be permissible to use carbon adsorption to treat this nonwastewater, so long as these concentration-based treatment standards for the wastewaters are ultimately achieved. However, if EPA has established a wastewater treatment standard expressed as "Carbon Adsorption as Method of Treatment" for this waste code, the nonwastewater described above must comply with the standard for the nonwastewater form, despite the fact that the TOC content is only slightly greater than 1 percent. This is not just a mechanical application of the requirement that treatment must be conducted by the specified method, with the treatability group determined at the point of generation. EPA established "Carbon Adsorption as Method of Treatment" standard for certain wastewaters based on the assumption that wastewaters typically contain TOC levels much less than 1 percent., so that removal of the organic constituents from these wastewaters is anticipated to be effective. If

Comment Number: 1-E-4 (Continuation)
Docket Number: LD12-00179
Commenter: Dow Chemical
Issue: General BDAT Aspects
Subissue: Wastewaters/Nonwastewaters
Response:

the nonwastewater previously described is subjected to carbon adsorption as a method of treatment, there would be no means of assuring optimum removal of the hazardous constituents, Thus, in such a situation, the use of carbon adsorption for this nonwastewater, is not permitted as a means of complying with PDAT. The Agency considers this an impermissible switching of applicable treatability groups and treatment standards.the nonwastewater previously described is subjected to carbon adsorption as a method of treatment, there would be no means of assuring optimum removal of the hazardous constituents, Thus, in such a situation, the use of carbon adsorption for this nonwastewater, is not permitted as a means of complying with BDAT. The Agency considers this an impermissible switching of applicable treatability groups and treatment standards.

Comment Number: 1-F-1
Docket Number: LD12-00081
Commenter: ENVIROSAFE MANAGEMENT SERVICES, INC.
Issue: GENERAL BDAT ASPECTS
Subissue: GRAB / COMPOSITE SAMPLES
Comment:

Page 48385, F.

EPA again explains its rationale for grab samples versus composite samples. The Agency spells out that this treatment standard should be achievable 99% of the time. This automatically puts you in a chance of 1 in 100 of being in violation of the Agency's own rules. The confidence level utilized in calculating BDAT levels should be at 100% not 99%, otherwise this treatment standard, based on the grab sample, guarantees failure. In order to ensure that any single grab sample is at or below the regulatory limit, the actual numerical treatment standard to which a facility must attempt to treat is below the published limit. Statistically, a facility must treat to a level which ensures that the upper control limit does not exceed the treatment standard. The Agency should perform an evaluation of the statistical effect of setting standards in this manner so that the regulated community does not attempt to achieve an impossible treatment standard and thereby be in near perpetual violation. The same type of argument is appropriate on the incineration levels because they are based above the levels of detection rather than at the detection limit.

Comment Number: 1-F-1
Docket Number: LD12-00081
Commenter: Envirosafe Mgmt Services
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

In response to concerns that treatment standards should be achievable only 99 percent of the time, The Agency intents to consider including an explicit upset defense in the land disposal restrictions regulations.

The upset defense would allow Agency enforcement personnel to distinguish between short-term noncompliance caused by statistical fluctuations an long term noncompliances caused by deliberate negligence. Additionally, if a batch of treated waste does not meet a treatment standard, the treater may re-treat the batch so that it does comply. As a result, site-specific retesting plans are not necessary because the BDAT principle is to treat until compliance is achieved. The treater may also control the operating parameters more closely, so that regulatory exceedances are less likely to occur.

Comment Number: 1-F-2
Docket Number: LD12-00110
Commenter: Thermal KEM/ CyanoKEM
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

GRAB VS. COMPOSITE SAMPLES

Treatment facilities are required to have waste analysis plans that are prepared based on approved EPA methods. Part of the waste analysis plan includes sampling methodology that is consistent with SW846 methods. SW846 methods encourage the collection of representative samples, which are based on compositing of samples from several locations in a treatment residual batch.

It is contradictory for EPA to go against SW846 methods in stating that enforcement can be based on merely a grab sample. Grab samples are not representative, are not consistent with proper SW846 methodology, and therefore cannot be relied upon for enforcement.

EPA regions are requiring TSD facilities to specify in their waste analysis plans how samples for testing compliance with Part 268 standards are collected. Since the EPA regions are also enforcing these requirements, it is logical and consistent to base sampling methodology completely on the facilities' waste analysis plan, especially since this WAP must be based on EPA SW846 methodology in order to be approved as part of the facilities' operating permit.

Comment Number: 1-F-2
Docket Number: LD12-00110
Commenter: ThermalKEM/CyanoKEM
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

Regarding the commenter's concerns on the use of grab versus composite sampling, EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use these composite data to develop the treatment standards. Where these data are used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-3
Docket Number: LD12-00136
Commenter: CIBA-GEIGY Corporation
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

Requiring SW-846 Protocol Instead of Grab or Composite Sampling

No definition of "grab sample" or "composite sample" is given in 40 CFR 260, general RCRA definitions, or in the EPA publication SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". In 54 FR 48385, which discusses grab samples versus composite samples, no definition of these sampling techniques was referenced.

SW-846, September 1986 revision, Volume 2 Chapter 9, begins with the statement, "The initial and perhaps most critical element in a program designed to evaluate the physical and chemical properties of a solid waste is the plan for sampling the waste."

This seventy-nine page section describes the appropriate statistical methods to use when sampling various types of waste. This reference is the standard which has governed methodology for RCRA chemical analysis. EPA should either specify that sampling be done according to SW-846 or explain why the sampling methods described in SW-846 are inappropriate for this regulation.

Comment Number: 1-F-3
Docket Number: LD12-00136
Commenter: Ciba-Geigy Corp.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

An individual facility's waste analysis plan will provide the basis for that facility's compliance monitoring. This plan must be adequate to assure compliance with part 268. However, a facility remains strictly liable for meeting the treatment standards, so that if it disposes of a waste that does not meet a treatment standard, it is in violation of the land disposal restrictions regulations. If the facility complied with its waste analysis plan, it would not be in violation of the waste analysis plan provisions. Put another way, a waste analysis plan cannot immunize land disposal of prohibited wastes, although such plans may be written to authorize types of sampling and monitoring different from those used to develop the treatment standard(s)

If a waste analysis were to authorize a different mode of sampling or monitoring, there would be need to demonstrate that the plan (and the specific deviation feature) is adequate to assure compliance with Part 268 (see 40 CFR 264.13(a)). This might require, for example, a demonstration of statistical equivalence between a composite sampling protocol and one based on grab sampling, or a demonstration of why monitoring for a subset of pollutants should assure compliance of those not monitored. (EPA repeats that enforcement of the rule is based on the treatment standard, not the facility's waste analysis plan, so that enforcement officials would normally take grab samples and analyze for all constituents regulated by the applicable treatment standards.)

Comment Number: 1-F-4
Docket Number: LD12-00159
Commenter: Waste Mgmt, Inc. and Chemical Waste Mgmt., Inc.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

Grab vs. Composite Samples for Compliance Testing (54 Fed. Reg. at 48,385-86)

EPA proposes that grab samples and not composite samples be used to determine compliance with land ban treatment standards because "grab samples normally reflect maximum process variability, and thus would reasonably characterize the ranges of treatment system performance." 54 Fed. Reg. at 48,386. Unless, however, a reasonably large number of grab samples are available, maximum process variability may well be grossly underestimated by use of grab samples. For example, a single annual grab sample for a particular waste stream would hardly provide a reasonable characterization of "maximum process variability", and might not even be representative of that waste stream on that particular sampling event.

As EPA has stated in SW-846, 3rd Edition, Nine-5: "The first reference, which occurs throughout the regulations, requires that representative samples of waste be collected and defines representative samples as exhibiting average properties of the whole waste." Taking grab samples does not meet this essential requirement of a good sampling plan.

Comment Number: 1-F-4 continued
Docket Number: LD12- 00159
Commenter: Waste Mgmt, Inc. and Chemical Waste Mgmt. Inc.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

EPA's conclusion that variability can be accounted for by grab samples is rebutted by its own published document. SW-846 establishes that variability cannot be determined from a single grab sample. SW-846, 3rd Edition, Nine-5, states: "The second reference, which pertains just to petitions to exclude wastes from being listed as hazardous wastes, specifies that enough samples (but in no case less than four samples) be collected over a period of time sufficient to represent the variability of the wastes." Unless multiple samples (increments) are taken, there is no defensible way to determine variability. A grab sample may reflect the highest value of the constituent, the lowest, or anything in between.

SW-846 also teaches, at 3rd Edition, Nine-6: "Sampling accuracy is usually achieved by some form of random sampling." Further, SW-846 states "The validity of data gathered in that manner (grab) is totally dependent on the knowledge of the sampler and although valid data can sometimes be obtained, authoritative (grab) sampling is not recommended for the chemical characterization of most wastes." Id. These two statements cannot be squared with EPA's reliance on grab sampling in this proposal.

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Comment Number: 1-F.4 continued
Docket Number: LD12-00159
Commenter: Waste Mgmt Inc. and Chemical Waste Mgmt Inc.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

In contrast to grab sampling, composite sampling is useful when the cost of analyzing multiple grab samples is prohibitive (as it is here if the waste stream is reasonably homogeneous or the sample is the result of a mining process). The composite sample will represent the average concentration of the potential grab samples. It is important to note that the total amount of a constituent present in the composite sample is equal to or greater than any single potential grab sample making up the composite; hence, the constituent may be more easily detected.

From a statistical perspective, when the number of potential observations is limited, composite sampling is clearly the method of choice for providing a "representative" index of a constituent level. It can also be easily shown that when compared to a treatment standard, a single composite sample will minimize both false positive and false negative rates relative to a single grab sample.

To illustrate this point, we conducted the following simulation study. First, ten background samples were drawn from a log normal distribution that was generated by taking the antilogy of data drawn from a normal distribution with mean zero and variance one. Second, a treatment standard was then generated using the EPA method, i.e.,

EXP [Y + 2.33 Sy]

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Comment Number: 1-F-4 continued
Docket Number: LD12-00159
Commenter: Waste Mgmt Inc. and Chemical Waste Mgmt Inc.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

where y is the exact mean of the natural log transformed values and Sy is the corresponding standard deviation. Third, from the same distribution, a new "grab sample" was selected and if this is now value exceeded the limit, a failure was recorded. Fourth, from the same distribution, four new samples were selected and then arranged to form a single composite sample, and if this composite sample exceeded the first, a failure was recorded. Fifth, steps 1-4 were then repeated 10,000 times, and the percent of failures for each of the two methods represent their false positive rates. Inspection of Figure 1 reveals that for a difference of zero SD units, the composite sample attains the intended 1% false positive rate, but for the grab sample approach, the false position rate is on the order of 4% (iz., 96 out of 100 measurements in compliance due to change alone). Sixth, steps 1-5 were then repeated for differences of .2, .4, .6, ..., 4.8, 5.0 SD units between the data used to construct the treatment standard and the simulated waste stream test data. In this way, we can compare grab samples and composite samples in terms of their false negative rate as well. Inspection of Figure 2 reveals that, in order to achieve a 5% false negative rate, the mean constituent level must be 4.2 SD units above the mean of the data used to construct the treatment standard if we use grab samples, but only 3.4 SD units if use a composite sample. Recall that in all of these cases, grab samples were used to construct the treatment standard; therefore, this simulation directly

Comment Number: 1-F-4 continued
Docket Number: LD12-00159
Commenter: Waste Mgmt Inc. and Chemical Waste Mgmt. Inc.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

reflects the actual case that exists in the BDAT treatment standard problem.

The results of the simulation reveals that by using composite samples, not only do we achieve the intended false positive rate (i.e., 99 out of 100 measurements are now in compliance due to change alone), but we also produce a test with a substantially lower false negative rate. Clearly, the use of composite samples is justified here, and if anything, it should be required.

There is a reasonably straightforward explanation for these results. The variability of an individual grab sample σ2; however, the variability of a composite at 4 samples, has variability σ2 or a standard deviation of σ/2. This result indicates that the compositive samples will have one half of the variability at the individual grab sample. By removing both high and low outlying values, the false positive rate is clearly minimized, and a far more consistent result is obtained when contamination is actually present; therefore, the false negative rate is also minimized. If decisions are to be made based on the result of a single analysis, composite sampling is clearly the method of choice, regardless of whether the treatment standards were derived from grab samples or composite samples.

Comment Number: 1- F-4 Continued
Docket Number: LD12-00159
Commenter: Weste Mgmt Inc and Chemical Waste Mgmt. Inc.
Issue: General BDAT Aspects
Subissue: Grab/ Composit Samples
Comment:

As a final note, it is interesting (but not surprising) that when composite samples are used, the elevated false positive rate of the EPA treatment standard disappears. The reason for this again stems from the difference between the distribution of

that a waste stream is reasonably well mixed, the composite sample reflects the average grab sample value.

Since the distribution of average value is narrower than that of individual values, the same limit value (i.e., treatment standard) will provide increased coverage of the distribution. This is the reason why 96 out of 100 grab samples will be in compliance but 99 out of 100 composite samples will be in compliance for a well designed and properly operated facility. Accordingly, WMI urges EPA to shift its reliance from grab samples to composite samples.

Comment Number: 1-F-4
Docket Number: LD12-00159
Commenter: Waste Mgmt Inc/Chemical Waste Mgmt
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The BDAT treatment standards are, with few exceptions, based on an analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA's enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-5
Docket Number: LD00164
Commenter: Institute of Chemical Waste Mgmt.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

Grab Samples

ICWM members are concerned by the proposal to use "grab samples" when verifying treatment of the wastes. The Institute recognizes that the Agency believes it has addressed concerns about the statistical procedures used to account for the wide variability in analytical results that can accompany the use of grab sampling techniques.

However, ICWM must emphasize that for the LDR Program the development of treatment standards, analytical procedures, and statistical evaluations have been based on analysis of fairly pure compounds and, in many cases, the simple transfer of data among treatability groups. The data used by the Agency often have not reflected the range of complex waste streams found in the "real world".

As members have attempted to apply required analytical methods to typical waste streams managed at commercial operations, problems such as that discussed below (see Practical Quantitation Limits) are not uncommon. Adding to analytical inconsistences, the use of "grab samples" for enforcement purposes will complicate an already difficult enforcement process.

Most managers of hazardous waste operations have implemented the standard practice of using "representative samples" for a variety of regulatory requirements. These include developing detailed waste profiles, screening incoming shipments of a waste to verify its anticipated composition, and analytical testing to verify treatment to LDR standards. The use of "grab samples" has no statistical significance with respect to determining compliance with LDR treatment standards and serves no useful purpose in monitoring commercial waste treatment systems. Thus, the use of this sampling technique is considered an unacceptable practice by the ICWM members.

Because enforcement and possibly substantial penalties will rest on these concentration values, the most scientifically principled sampling and analytical accuracy and precision must be maintained. Therefore, the ICWM strongly recommends that the Agency require representative samples to be used in all analytical procedures employed by the regulated community as well as enforcement officials. The consequences of inaccurate sampling are too great to depend on less accurate and imprecise sampling methodologies.

Comment Number: 1-F-5
Docket Number: LD12-00164
Commenter: Institute of Waste Management
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

Regarding the commenter's concerns on the use of grab versus composite sampling, EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-6
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

III. A.1.f. - Treatment Standards Based on Single Facility Data Grab Samples Versus Composite Samples, and Waste Analysis Plans

EPA "believes that the use of a small number of data sets from a single treatment facility can be representative" of the results achieved by the treatment system. Fed. Reg. 48383. The Agency explains that standards are set to reflect the variability inherent in all treatment processes, and are intended to establish a standard achievable 99% of the time by a well-designed facility. EPA also states that it bases its analyses on wastes that are representative of those that are most difficult to treat, apparently meaning that any individual facilities chosen should meet this criterion. (The variability analysis was described in more detail in a Notice of Availability of Data, 51 Fed. Reg. 31783 (Sept. 5, 1986).)

EPA also notes that standards for organic constituents based on incineration are established above the level of detection even though the performance of such systems should be better than this. 54 Fed. Reg. 43386.

EPA notes that treatment standards will be based on grab samples rather than composite samples where possible so as to reflect maximum process variability and range of performance. Enforcement will be based on grab samples, except that when a standard is set by composite samples enforcement will be on the same basis.

Comment Number: 1-F.6 continued
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composit Samples
Comment:

Despite the fact that EPA anticipates that 1% of the samples from even a well-run facility will exceed the standard, the Notice seems to say that disposal of such waste is a violation. That is, if a single grab sample exceeds the standard, EPA seems to regard this as a violation even if subsequent testing shows that the treatment is in fact achieving the anticipated level of 99% confidence. Fed. Reg. 43386

EPA's approach raises a number of problems:

(a) Use of Data From a Single Facility

Obviously, EPA is correct in its view that data from a single facility should be used in setting a general standard only if that facility creates waste that is more difficult to treat than waste from other facilities. If this condition is not met, if the waste from the sample facility is less difficult to treat rather than more difficult, then the application of the treatment technology at other facilities will not result in attainment of the standard. The same problems arise when the standard is based upon data from a small number of facilities, though of course the concern is not as acute as it is when data from only one facility is used.

Comment Number: 1-F6 continued
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab / Composite Samples
Comment:

For K048 to K052 wastes, EPA's data do not meet this condition that data from a single facility (or, by extension, a limited number of facilities) is adequate only if the facilities represent the "hardest-to-treat" end of the spectrum. The limited data upon which EPA based the standards set in the First Third rulemaking, and on which it plans to base the revised standards set forth at 54 Fed. Reg. 48459-61, does not represent waste that is most difficult to treat. Consequently, application of EPA's variability analysis to the waste does not result in a realistic standard.

The problems with the Agency's database have been thoroughly documented by API in its "Petition for Reconsideration and Amendment of Land Disposal Treatment Standards for Certain Petroleum Refining Industry Wastes," filed with EPA on October 20, 1989, and cited in the notice at 54 Fed. Reg. 48460. As API noted there:

> These data [submitted in the Petition] confirm substantial, in some cases enormous, variations in the metallic concentrations of untreated wastes within the industry, far greater than the variations reflected in EPA's limited data base. [Footnote omitted.] Moreover, even within the one refinery that provided the samples . . . concentrations in the untreated . . . waste varied more widely over time than EPA's 'snapshot' would indicate. [Petition, at pp. 17-18.]

Comment Number: 1-F-6 continued
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

EPA has stated that this Petition may be used by the Agency to provide further revisions to the K048/K052 standards that were made final in the First Third rule. Fed. Reg. 48460 API suggests that the need for the Agency to take this action is imperative.

(b) Use of a Limited Number of Waste Samples

Another significant issue not addressed by EPA concerns the interaction between the number of data points and the 99% variability standard. As API discussed in earlier comments, the confidence intervals depend greatly on the number of data points. See API First Third Comments, pp. 39-41 & Attachment 3. If the number of points is small, then the estimate of the 99% level may not be accurate.

(c) Use of Grab Samples for Enforcement

EPA also overlooks a crucial problem raised by its intent to use grab samples in enforcing the land disposal prohibition.

According to the Agency, the treatment standard is set at a level that will be met by a well-designed, properly functioning facility 99% of the time. This is a sensible approach to standard setting, but it does not fit well with EPA's approach to enforcement. By definition, the approach means that 1% of waste samples taken after treatment will exceed the standard, and will subject the disposer to the risk of substantial penalties under RCRA, even though the waste was subject to a fully-approved and adequately controlled treatment program.

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Comment Number: 1-F-6 continued
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

Given the severity of RCRA's civil and criminal penalties, no sensible company or employee will regard a 1% risk that a sample will exceed the standard as acceptable. Realistically, the company's confidence level that a sample meets the standard will need to be much higher than 99%. It will have to be 99.99% or even higher. This confidence level cannot be met by a treatment process that produces results at the level mandated by EPA, since that level has built-in 1% error rate. This means that the true treatment standard for operating purposes would have to be much lower than EPA anticipates.

Since there is grave doubt that even EPA's proposed standards can be met, this disjunction between EPA's approaches to standard-setting and enforcement could create a serious problem. If industry relied on EPA's standards, the violation rate might be 1% of all waste samples, which would be intolerable. If industry tried to avoid the violations by increasing the confidence level, the standards would be unattainable.

Comment Number: 1-F-6 continued
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

The best solution to this problem would be for EPA to establish standards using all the data, as API has repeatedly recommended, and to calculate the projected 99% variability level. However, this 99% level should be used as an action level, not as a definition of a per se violation. That is, a sample in excess of the 99% level should trigger a requirement that the disposer do additional testing to demonstrate that the standard is being met at the level anticipated by EPA when it set the standard in the first place. It should not, by itself, be classified as a violation.

Finally, setting a standard on the basis of an average of the results achieved from treatment of several wastes leaves still another problem. To the extent that the residue concentrations vary with the concentrations in the original wastes, standards based on such averages will not be attainable at the 99% confidence level when the treatment process is applied to wastes that are most difficult to treat. EPA needs to develop a mechanism that allows for a more flexible trigger level in such circumstances.

Comment Number: 1-F-6
Docket Number: LD12-00168
Commenter: American Petroleum Institute
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The Agency agrees that in many cases the EPA data base contains only a few data points on which to base BDAT numerical standards. However, the Agency has used the best data available from the chosen technology and believes that the statistical methods used to calculate the variability factors account for this small data base. Industry may submit more extensive data if desired, and EPA has solicited such data repeatedly. In the absence of superior data, however, and given the statutory deadlines, EPA must act based on what information is available.

The BDAT treatment standards are, with few exceptions, based on analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA;'s enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

Comment Number: 1-F-7
Docket Number: LD12-00172
Commenter: Hazardous Waste Treatment Council
Issue: General BDAT Aspects
Subissue: Grab / Composit Samples
Comment:

B. Grab vs. Composite Samples

Treatment facilities are required to have waste analysis plans that are prepared based on approved EPA methods. Part of the waste analysis plan includes sampling methodology that is consistent with SW846 methods. SW846 methods encourage the collection of representative samples, which are based on compositing of samples from several locations in a treatment residual batch.

It is contradictory for EPA to go against SW846 methods in stating that enforcement can be based on merely a grab sample. Grab samples are not representative, are not consistent with proper SW846 methodology, and therefore cannot be relied upon for enforcement.

EPA regions are requiring TSD facilities to specify in their waste analysis plans how samples for testing compliance with Part 268 standards are collected. Since the EPA regions are also enforcing these requirements, it is logical and consistent to base sampling methodology completely on the facilities' waste analysis plan, especially since this WAP must be based on EPA SW846 methodology in order to be approved as part of the facilities' operating permit.

Comment Number: 1-F-7
Docket Number: LD12-00172
Commenter: The HWTC
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The BDAT treatment standards are, with few exceptions, based on an analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA's enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-8
Docket Number: LD12-00184
Commenter: The Lubrizol Corp.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

V. The Use Of Grab Samples In Enforcing The Land Disposal Restrictions Should Not Replace The Need For Taking Representative Samples.

In explaining its enforcement policy at 54 Fed. Reg. 48386, EPA implies that grab samples are relevant in determining compliance with the land disposal restrictions. Lubrizol urges the Agency not to abandon the principle that data obtained in accordance with a facility's waste analysis plan and representative samples should be used in determining compliance. Moreover, such samples should be representative of the overall waste utilizing methods described in SW-846, Third Edition.

Comment Number: 1-F-8
Docket Number: LD12-00184
Commenter: The Lubrizol Corp.
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The BDAT treatment standards are, with few exceptions, based on an analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA's enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-9
Docket Number: LD12-00240
Commenter: Amoco Corporation
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Comment:

Section III.A.1.f.(2)

EPA indicates that when standards are set based on grab samples, enforcement will also rely on grab samples. Since the never-to-be exceeded standards are derived by EPA to be at 99% levels, it would follow that 1% of the grab samples would be out of compliance. This is an unacceptable rate of failure by design. EPA should develop a more appropriate means of demonstrating compliance and enforcement.

Comment Number: 1-F-9
Docket Number: LD12-00240
Commenter: Amoco Corp
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

In response to concerns that treatment standards should be achievable only 99 percent of the time. The Agency intents to consider including an explicit upset defense in the land disposal restrictions regulations.

The upset defense would allow Agency enforcement personnel to distinguish between short-term noncompliance caused by statistical fluctuations an long term noncompliances caused by deliberate negligence. Additionally, if a batch of treated waste does not meet a treatment standard, the treater may re-treat the batch so that it does comply. As a result, site-specific retesting plans are not necessary because the BDAT principle is to treat until compliance is achieved. The treater may also control the operating parameters more closely, so that regulatory exceedances are less likely to occur.

Comment Number: 1-F-10
Docket Number: LD12-00250
Commenter: James E. Clemmer
Issue: General BDAT Aspects
Subissue: Grab/Composit Samples
Comment:

EPA's proposed sampling methods are inconsistent and arbitrary.

EPA's proposed requirement for "any single grab sample" to meet the standard is wholly inconsistent with the regulations of 40 CFR 261.20(c). This regulation requires that the samples, which classify a waste as characteristically hazardous, to be "representative, i.e., represent the universe or whole of the waste [40 CFR 260.10].

Comment Number: 1-F-10
Docket Number: LD12-00250
Commenter: James E. Clemmer
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The BDAT treatment standards are, with few exceptions, based on an analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA's enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-F-11
Docket Number: LD12-00261
Commenter: Disposal Systems, Inc.
Issue: General BDAT Aspects
Subissue: Grab / Composite Samples
Comment:

SAMPLING PROBLEMS

Due to the complex nature of commercially disposed waste streams, we are concerned with the use of grab samples when verifying treatment of waste for enforcement purposes.

Statistically valid, representative samples should be used in all analytical procedures. A small sampling error could spell grave consequences for an otherwise compliant situation.

Comment Number: 1-F-11
Docket Number: LD12-00261
Commenter: Disposal Systems, Inc
Issue: General BDAT Aspects
Subissue: Grab/Composite Samples
Response:

The BDAT treatment standards are, with few exceptions, based on an analysis of multiple grab samples. The average of the treated grab samples is then multiplied by a factor (referred to as a variability factor) that accounts for treatment process variations and analytical variations. Accordingly, enforcement based on grab samples is consistent with the manner in which the standards were developed. EPA's enforcement position that the sample be representative refers to the waste "representing" the specific waste of interest, not to the sample representing the full range of treatment levels of that waste. Accordingly, EPA does not recognize any inconsistencies between this requirement and the requirement to comply with any single grab sample.

EPA does not believe that composite samples are preferable for treatment standards applicable to to land disposal of wastes. Treatment of hazardous wastes is rarely performed on a continuous basis for a significant period of time for any given waste code; even if the system is itself a continuous process, any given waste is, in general, treated for a short time and then collected and stored in preparation for disposal. If the standards were based on composite sampling taking multiple samples of treated and stored wastes would not have any significance from a regular regulatory perspective. Specifically, in these situations standards would have been developed by taking several samples over discrete time intervals; however, enforcement personnel would be faced with the difficulty of sampling from a group of drums that may or may not have any correlation with the way of treatment standards were developed. On the contrary, enforcement in such a situation would not be difficult when treatment standards are based on grab samples. Under these circumstances, enforcement personnel could take a simple sample from any drum and thereby make a compliance determination.

However, in cases where only composite data exist, the Agency considers the QA/QC of the data, the inherent efficiency of the process design, and the level of performance achieved. The Agency may then choose to use this composite data to develop the treatment standards. Where these data is used to establish the treatment standard, the treatment standard is identified as based on analysis of a composite sample. Enforcement of that standard thus would also be based on composite samples.

Comment Number: 1-6-1
Docket Number: LD12-00081
Commenter: ENVIROSAFE MANAGEMENT SERVICES, INC.
Issue: GENERAL BDAT ASPECTS
Subissue: QUANTIFICATION COMPLICATIONS FOR P/U WASTES
Comment:

Page 48387, 3rd Col.

EPA indicates four quantification complications that exist for U & P chemicals. That list should also be expanded to include physical matrices which are difficult to treat such as tyvek, concrete and debris. The addition of these materials in spill cleanups increases the complications for quantification of the material spilled.

Comment Number: 1-G-1
Docket Number: LD12-00081
Commenter: Envirosafe Mgmt Services
Issue: General BDAT Aspects
Subissue: Complications for P & U Wastes
Response:

The Agency is amending 40 CFR 261.33 to clarify the regulations pertaining to "P" and "U" hazardous wastes. The amendment will add residues to 40 CFR 261.33(f) materials remaining in containers and in inner liners to the residues already included in the scope of the commercial chemical product listings. The existing language is partially in error, and the Agency is correcting it with today's revisions. EPA is not promulgating the proposed amendments to 40 CFR 261.33 regarding soil, water, and spill debris contaminated with 40 CFR 261.33(e) and (f) (P and U wastes) materials.

Comment Number: 1-H-1
Docket Number: LD12-00081
Commenter: ENVIROSAFE MANAGEMENT SERVICES, INC.
Issue: GENERAL BDAT ASPECTS
Subissue: SOIL AND DEBRIS
Comment:

Page 48469, 8.	EPA's attempt to clarify the applicability of treatment standards on soil and debris leads to further confusion.
Page 48489, 3.	In the confusion surrounding soil and debris and until such time as EPA sets the appropriate requirements for them, EPA should review the option whereby if the contaminant in soil and debris has a BDAT that is stabilization, then EPA should cite the technology as a treatment standard rather than try to develop numerical standards.

Comment Number: 1-H-1
Docket Number: LD12-00081
Commenter: Envirosafe Mgmt Services
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply. If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards. EPA recently promulgated one such variance for chromium-containing debris generated by Allied Chemical.

Comment Number: 1-H-2
Docket Number: LD12-00090
Commenter: INTERNATIONAL TECHNOLOGY CORPORATION
Issue: GENERAL BDAT ISSUES
Subissue: SOIL AND DEBRIS
Comment:

Soil and Debris

IT supports an exemption from best demonstrated available technologies treatment standards or specified treatment technologies for debris which is physically not amenable to the treatment (e.g., large, bulky items such as tanks, concrete foundations, pipe, wood, or plastic). A general exemption should be incorporated into the regulations, to be interpreted by permit writers on a site-specific basis. The site-specific variance procedures currently administered by EPA headquarters are too cumbersome for this common problem.

Comment Number: 1-H-2

Docket Number: LD12-00090

Commenter: International Technology Corp.

Issue: General BDAT Aspects

Subissue: Soil & Debris

Response:

Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply.

If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards. In order to be granted a site-specific variance from the treatment standard, the petitioner must demonstrate to the Agency that because the physical (or chemical) properties of the waste differs significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

Comment Number: 1-H-3
Docket Number: LD12-00096
Commenter: FRANK, BERNSTEIN, CONAWAY, & GOLDMAN FOR ALLIED-SIGNAL INC.
Issue: GENERAL BDAT ASPECTS
Subissue: SOIL AND DEBRIS
Comment:

A. BDAT for Chromium-Contaminated Soil and Debris.

1. BDAT Standard. In its Proposed Rule, EPA states that soil and debris contaminated with wastes subject to the land disposal restrictions are themselves subject to these restrictions. 54 Fed. Reg. 48469. For chromium-contaminated soil and debris, this means that nonwastewaters must achieve a standard of 0.094 mg/l for total chromium, based upon an analysis of the TCLP extract, and wastewaters must achieve a standard of 0.32 mg/l for total chromium.1/

EPA's proposal to base BDAT for D007 non-wastewaters upon treatment techniques for K062 wastes does not recognize the unique difficulties of treating chromium-contaminated debris. The chromium-contaminated debris at the Works includes several thousand tons of large items that have been impregnated with chrome: roasting kilns, bricks inside the buildings, structural steel, poured concrete floors and equipment foundations, transite panels.

1/ Allied supports the achievability of the proposed BDAT treatment level of 0.32 mg/l for D007-contaminated wastewaters. Allied has had substantial experience at the Works in treating D007-contaminated wastewaters at levels as high as 400 mg/l and has been able to achieve a standard of 0.32 mg/l (or less). Allied does not know whether its experience is representative of other treaters of D007 wastewaters, as it has handled D007 wastewaters that are not contaminated with other substances.

With respect to D007 nonwastewaters, Allied strongly disputes the propriety of establishing BDAT treatment standards based upon a transfer of treatment technologies for K062 and F006 wastes to chromium-contaminated debris. These standards were developed in the context of treatment of finely divided particles and do not take into account the physical limitations of such treatment technologies for debris.

Allied notes that both the wastewater and the nonwastewater treatment standards are below characteristic levels. Allied has submitted lengthy comments under separate cover addressing the questionable legality of this proposal. See comments of Swidler & Berlin on behalf of Allied-Signal Inc.

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Comment Number: 1-H-3 (CONTINUED)
Docket Number: LD12-00096
Commenter: Frank, Bernstein, Conaway & Goldman for Allied-Signal Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

wiring, and related materials. These materials are not granular or readily permeable, nor can they be transformed into such physical form in any practical manner. Conventional shredding technology is designed to reduce automobile-sized objects to brick-sized objects, as opposed to the granular material that the K062 technology transfer contemplates. Shredded chunks of material probably cannot be stabilized by simply adding chemical reducing agents, and following this treatment by precipitation and sludge dewatering. Even if shredding or grinding into fine particles were physically possible in some cases, doing so would create inhalable chrome dust. The generation of and exposure to this dust would create exactly the kind of potential cancer risk that the Dismantlement Plan was designed to avoid. The Dismantlement Plan calls for application of extraordinary, state-of-the-art dust control technology to protect the work force and the public. Deliberate production of this hazardous dust would be contrary to the objectives of the Consent Decree and to the protection of human health and the environment.

At Allied's request, B&V Waste Science and Technology Corporation contacted all of the thirty waste treatment providers listed in the EPA docket, plus four additional facilities to which it was referred by those providers, regarding treatment technologies capable of reducing the chromium levels in its debris to the proposed BDAT levels. Each of these companies indicated that it did not have a demonstrated and available waste treatment technology capable of treating D007-contaminated debris. Appendix 1 contains records of each of the telephone contacts, a summary memorandum, and a table summarizing these contacts (the "B&V Telephone Survey").

The Preamble to the Proposed Rule correctly recognizes that contaminated soil and debris have certain unique problems associated with their treatment. 54 Fed. Reg. 48469. These problems are particularly acute for debris, which can range in size from small particles to large tanks and buildings. Id. Accordingly, EPA has acknowledged the need to establish separate treatability groups and separate treatment standards for contaminated soil and debris. Id. Nevertheless, EPA has not made the required BDAT or capacity determinations as part of this Proposed Rule; instead, EPA has arbitrarily lumped soil and debris together with the materials for which the prescribed BDAT technology may be appropriate. Moreover, EPA has not granted a National Capacity Variance to D007-contaminated soil and debris because the BDAT is not combustion, vitrification, mercury retorting, or wet air oxidation. 54 Fed. Reg. 48489 and 48511 (proposed 40 C.F.R. 268.35(h)).

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Comment Number: 1-H -3 (CONTINUED)

Docket Number: LD12-00096

Commenter: Frank, Bernstein, Conaway, + Goldman for Allied Signal Inc.

Issue: General BDAT Aspects

Subissue: Soil and Debris

Comment:

2. Definition of Debris. Much of Allied's debris would not fall under EPA's proposed definition of debris. EPA's discussion and examples suggest that, if a material is man-made, it can be considered debris only if it is wholly or partially buried. 54 Fed. Reg. 48489. No reason is offered for distinguishing between, e.g., contaminated brick flooring and contaminated brick walls (both of which are found at the Works) or between contaminated steel ceiling beams and contaminated steel rail tracks (also both found at the Works). These materials do not differ in degree of contamination or amenability to treatment, and they should be similarly regulated.

Allied submits that a proper definition of debris must be included in the Final Rule. An appropriate definition of debris would be fragments, remains, ruins, or rubbish, whether found above or below the ground, and whether non-geologic or geologic in origin, if the proportion of rock-sized particles (9.5mm sieve size) is "at a total level that, based on engineering judgment, will affect performance of available treatment technologies." See 54 Fed. Reg. 48489.

(CONTINUED)

Comment Number: 1-H-3 (CONTINUED)
Docket Number: LD12 - 00096
Commenter: FRANK, BERNSTEIN, CONAWAY, & GOLDMAN FOR ALLIED-SIGNAL INC.
Issue: GENERAL BDAT ASPECTS
Subissue: SOIL AND DEBRIS
Comment:

III. Options for the Final Rule for the Baltimore Works

Allied cannot comply with the Proposed Rule for D007-contaminated debris and execute its Dismantlement Plan as required by the Consent Decree. No treatment technology currently exists for D007-contaminated dismantlement debris, because of the unique physical attributes and characteristics of these materials, and none is expected within the foreseeable future. Without some relief, Allied anticipates that it will be forced to invoke force majeure on May 8, 1990 and immediately terminate all remediation activities at the Works.

With this dilemma in mind, Allied has examined the options available to EPA in preparing the Final Rule. It has identified the four following alternatives, each of which could provide a solution to this unique situation. Allied believes the first two alternatives are more appropriate to the circumstances and the objectives of RCRA.

A. Grant Site-Specific Variances to Sites that were Subject to RCRA Corrective Action Consent Decrees Before November 22, 1989.

Allied is bound by a court-approved and EPA-approved RCRA Consent Decree to generate approximately 13,000 tons of debris contaminated by characteristic hazardous wastes that cannot be treated as required by the Proposed Rule. In the process, Allied is specifically required to remove physically as much contamination as possible by high-pressure water blasting, wood shaving, vacuuming, and similar physical separation methods. The preparation, review, and approval of the Dismantlement Plan in the Consent Decree are the fruit of three years of effort by Allied, MDE, EPA Region III, EPA Headquarters, and the Department of Justice. The environmental costs and benefits of the specific dismantlement and disposal technologies to be used were thoroughly considered by all concerned, including the public, during the period for public review and comment.

In these circumstances, it is both lawful and appropriate for EPA to honor the specific commitments and expectations of the parties to the Consent Decree and the larger affected community by granting, as part of the Final Rule, a 40 C.F.R. 268.44 variance to the Baltimore Works to allow (and, by removing any force majeure defense, in effect to require) Allied to fulfill its obligations as contemplated under the Consent Decree and dispose of its hazardous

(CONTINUED)

Comment Number: 1-H-3 (CONTINUED)
Docket Number: LD12-00096
Commenter: Frank, Bernstein, Conaway & Goldman for Allied Signal Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

debris at the RCRA-permitted D007 monofill operated by the State of Maryland at Hawkins Point.

Such a transitional approach would set no precedent for the management of debris in the future or at sites where the remedy has not undergone similar scrutiny or obtained specific EPA approval prior to the issuance of the Proposed Rule. Allied is not aware of any other sites that are similarly situated, so the impact of even a generic transitional policy may not reach beyond the Baltimore Works. If other similar cases do exist, a variance may well be equally appropriate.

B. Grant a Site-Specific Variance for the Baltimore Works as Part of the Final Rule.

Another alternative is for EPA to issue a site-specific variance for the Works under 40 C.F.R. 268.44 as part of the Final Rule, on the ground that the information submitted in these comments [and any supplemental information EPA requests and Allied submits between now and May 8, 1990] provides sufficient support for the variance. This approach could be used for other "transitional" or "hardship" situations that have been brought to EPA's attention to avoid the hiatus in operations that will necessarily occur if individual variance applications are only accepted after the Final Rule goes into effect.

So far, the Agency has indicated informally that it will not entertain any site-specific variances until the proposed rule has been finalized on or before May 8, 1990. The substantial technical analysis called for by EPA's internal guidance on treatability variance applications suggests that many months of effort may be necessary to perform the studies and canvass the many purveyors of treatment services and treatment equipment to demonstrate eligibility for a variance. The variance procedure also requires EPA review, public notice and comment, and a final decision by the Assistant Administrator for the Office of Solid Waste and Emergency Response. Particularly in the early months of this program, it is difficult to imagine that such a variance, no matter how fully supported, would be issued in less than a year. In the meantime, Allied is required to perform specific tasks by specified deadlines. Until the Agency provides some solution for this problem, Allied anticipates that it will need to invoke force majeure and immediately cease all corrective action at the Works until the Agency acts upon its site-specific variance application. Only a site-specific variance by rule can avoid this result.

(CONTINUED)

Comment Number: 1-H-3 (CONTINUED)
Docket Number: LD12-00096
Commenter: Frank, Bernstein, Conaway + Goldman for AlliedSignal Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

C. **Establish a Separate Treatability Group for D007-Contaminated Debris and a Technology-Based Treatment Standard.**

A third alternative, most in keeping with the regulatory scheme but technically most demanding, would be to establish a new treatability subcategory within the D007 waste code for debris, with a technology-based treatment standard. The Preamble itself recognizes that debris is fundamentally different from the K062 and F006 wastes from which EPA proposes to transfer the treatment standard for D007 wastes. The physical size reduction step inherent in the TCLP evaluation procedure renders any numerical treatment standard inappropriate for debris, because physical configuration is crucial to environmental performance for debris.

The only available demonstrated technology for D007 debris is the application of physical removal techniques such as scraping, vacuuming, wood shaving, or high-pressure water blasting to achieve the maximum degree of separation of contaminants from the base debris materials. This approach is exactly what has been incorporated into the Dismantlement Plan in the Consent Decree for the Works, which EPA recently approved. Application of this cleaning technology-based standard will place much of the chromium contamination in a physical matrix that is amenable to the reduction-precipitation process that EPA has identified for D007 wastes. At the same time, it will remove the most environmentally available contamination from the base material. As a result, the two goals of reduction in the volume and the toxicity of the waste stream will be achieved.

D. **Grant a Two-Year National Capacity Variance for all D007-Contaminated Debris.**

A final alternative would be to grant a National Capacity Variance for D007-contaminated debris, relying on the evidence in Appendices 1 and 2 to show that no capacity is available. While this approach fits most easily into the current rulemaking scheme, it is less persuasive analytically than any of the other options listed here. The reason for this conclusion is that the supposed lack of "capacity" does not represent an insufficient supply of some known, demonstrated treatment technology by which D007-contaminated debris could be treated to meet the numerical treatment standards announced in the Proposed Rule; rather, it reflects the fact that no

(CONTINUED)

Comment Number: 1-H-3 (CONTINUED)
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Comment:

demonstrated technology exists that can bring debris into compliance with the D007 BDAT standards, because the physical characteristics of debris make the contemplated D007 treatment technology unworkable. Nevertheless, a two-year National Capacity Variance for D007 debris would be an acceptable solution to Allied's dilemma, because in that period Allied could complete the dismantlement and disposal of its debris.

Allied urges EPA to adopt either alternative A. or B. as most suited to the circumstances of the Works and consistent with the overall objectives of RCRA.

We appreciate your consideration of these comments. Please contact us if you desire clarification or further information.

Very truly yours,

FRANK, BERNSTEIN, CONAWAY
& GOLDMAN

SAMUEL A. BLEICHER
AMY L. EDWARDS

Comment Number: 1-H-3
Docket Number: LD12-00096
Commenter: Frank, Bernstein, Conaway & Goldman (Allied Signal, Inc)
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

The Agency also received comment requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks and other inorganic soil debris. The Agency agrees that these as well as other similar wastes form a different treatability group, and is identifying this group of D004 through D011 waste as the "inorganic solid debris" treatability group. Wastes in this treatability group are defined in Section 268.2 (a)(7) of today's rule.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration based treatment standards for these wastes as for other characteristic metal wastes.

Thus, there are no separate treatment standards for inorganic solid debris D004 through D011 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D004 through D011 wastes do not apply to inorganic solids debris until May 8, 1992.

For further detail on this issue see Section III A of today's Final rulemaking Federal Register notice.

Comment Number: 1-H-4
Docket Number: LD12-00105
Commenter: American Chrome & Chemicals Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

With regard to treatment standards for soil and debris, we believe that the requirement for individual site-specific variances is unnecessarily burdensome at least for D007 wastes. We doubt, that there exists sufficient treatment capacity able to achieve the characteristic level much less the very low TCLP extract values proposed for non-wastewater D007 wastes. We are now conducting our own survey in an attempt to identify suitable treatment facilities but do not yet have any responses. As noted in Sections III.A.8. and III.B.3. debris may consist of a wide variety of materials. We expect that most of these will have to be reduced in size to that specified by the TCLP test before treatment is performed. Reducing the size after treatment but before testing is likely to expose additional leachable chromium. We do not believe that treatment facilities have adequate comminution equipment to accomplish this for the wide variety of wastes involved. We request that a national variance for D007 soil and debris be granted until treatability groups and treatment standards can be established or it can be verified that there are treatment facilities with the necessary equipment.

Comment Number: 1-H-4
Docket Number: LD12-00105
Commenter: American Chrome & Chemicals Inc
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply. In this rulemaking, the Agency developed two treatability groups for debris contaminated with characteristic metal wastes. The "organic debris" treatability group has incineration followed by stabilization as the treatment standard. The "inorganic solids" treatability group is not subject to a separate treatment standard, but is subject to that of the characteristic metal. Both treatability groups are subject to a two-year capacity variance.

If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards. In order to be granted a site-specific variance from the treatment standard, the petitioner must demonstrate to the Agency that because the physical (or chemical) properties of the waste differs significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

Comment Number: 1-H-5

Docket Number: LD12 - 00107

Commenter: American Association of Manufacturers

Issue: General BDAT Aspects

Subissue: Soil and Debris

Comment:

Treatment of Soil and Debris

Soil and debris contaminated with wastes subject to LDRs are currently subject to the same restrictions as multi-source leachate. Until further regulatory action is taken, EPA requires that contaminated soil and debris must meet the promulgated treatment standards for the contaminating hazardous wastes prior to land disposal. It is difficult to regulate hazardous wastes in soil and debris because of the problems associated with obtaining a representative sample of the waste. In addition, the wide variety of soil and debris makes it difficult to organize them into treatability groups.

Until this can be done, EPA will allow alternate treatment standards for these waste as site-specific variances from the treatment standards. EPA remains unsure, but dedicated, to tackling the problem on a site-specific basis categorizing such waste according to type, volume, form, and contaminant concentration in spite of the problems in doing so.

Site-specific variances from the treatment standards will be granted to the petitioner who demonstrates that, because the physical (or chemical) properties of the waste differ significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods. NAM will withhold further comment on this section of in anticipation of the proposed BDAT standards for contaminated soil and debris that may establish the "proper" methods of decontamination.

Comment Number: 1-H-5
Docket Number: LD12-00107
Commenter: American Association of Manufacturers
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply.

If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards. In order to be granted a site-specific variance from the treatment standard, the petitioner must demonstrate to the Agency that because the physical (or chemical) properties of the waste differs significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

Comment Number: 1-H-6
Docket Number: LD12-00110
Commenter: Thermal KEM / CyanoKEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

A. Debris Waste

Certain types of debris materials such as discarded processing equipment and other contaminated materials that are generated from handling and cleanup of waste spills, cannot be stabilized by existing commercially available treatment technology to comply with the proposed EPA BDAT land disposal standards for TCLP leachable metals in characteristic wastes.

Debris may be defined as any material that neither can pass into nor through the normal primary, secondary or tertiary treatment steps because of its physical size and/or properties. Municipal wastewater treatment plants typically remove unwanted, damaging debris with bar screens, grit chambers, and similar devices. This type of material consists of wood, metal, glass, plastic, stone, sand and other rigid objects that cannot be pumped, mixed or otherwise conveyed through they system.

At least 50 percent of the contaminated debris are metal objects from processing equipment and products. Other frequently encountered objects are structural materials such as concrete, bricks, wood, glass and plastic. Cloth and fibrous materials such as discarded filter cloths, cartridges, gloves and protective wear are found in cleanup debris rolloff boxes. Materials similar to the above of various sizes, are also found in drums inter-mixed with sludges, salts and solutions.

In the case of waste mixed with debris, the decontamination proceeds by dissolving the soluble salts in process tanks. The solids, including salts and debris, are dissolved and treated.

Comment Number: 1-H-6 (continued)
Docket Number: LD12-00110
Commenter: Thermal KEM / Cyano KEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

In other cases, maintenance cleanup operations at chemical or manufacturing facilities, as well as abandoned site cleanup operations by federal and state agencies, generate debris contaminated with metal constituents. These constituents can be removed to a degree by repeated washings, but there is a limited extent to which these metal constituents can be removed, either because of absorption effects, on the debris or because the debris is comprised of metallic parts or scrap metal, which as part of the pure original substrate, leach metals in excess of BDAT standards.

Following decontamination of these debris materials, the metallic substrates and precipitated metals incorporated in and adsorbed on concrete, stone, wood, plastic and fabric materials can leach levels of metals that are higher than the land disposal BDAT standards for characteristic waste codes. These debris materials are not compatible with processing by available metal stabilization technology. Some specific examples are as following:

Metal Objects, Structures and Scraps

A large percentage of the weight of total debris material is metallic pieces and objects that can leach metals directly from the substrate and/or surface platings when subjected to TCLP tests. Typical examples of these materials are:

- Lengths of metal pipe, tubing, fittings, and hangers
- Bolts, nuts, washers and fasteners
- Cut-up tanks, drums and other scraps
- Cut-up salt pots
- Discarded and disassembled duct work and hoods
- Discarded tools, machinery parts, wire, cable, conduit, chain and strapping
- Discarded off-spec product and fragments of metal products, parts and electrodes

Comment Number: 1-H-6 (continued)
Docket Number: LD12-00110
Commenter: Thermal KEM / Cyano KEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

Rigid Porous Objects

Major cleanup operations as well as general maintenance at industrial facilities generate a wide range and sizes of discarded contaminated structural and natural materials. These materials, because of their porous rigid structures absorb contaminating materials such as cyanide and metals salts and solutions. Proper disposal of these materials requires decontamination of surface and inner porous areas as much as possible, by soaking, washing, flushing, draining and rinsing techniques. Following decontamination concentrations of metals exceeding stabilization treatment standards can be leached from absorbed metal precipitates by TCLP tests. Typical examples of these materials are:

- Broken concrete slabs and structures
- Concrete and cinder blocks, and various kinds of brick
- Wood in various sizes, shapes and configurations
- Stones, rocks, pebbles, and grit
- Rigid insulation materials

Rigid Non-Porous Materials

Various rigid, non-porous materials are also a significant fraction of typical debris. These materials can directly adsorb metals onto their surfaces during their useful life and retain these metals during decontamination treatment. However TCLP test conditions can desorb these metals giving rise to concentrations in the leachate samples in excess of the standards developed for F006 and D coded waste non-wastewater residues. Typical examples of these materials are:

- Pieces of plastic drums, tanks, liners and sheets
- Plastic piping, tubing, hose, duct and fittings
- Glass, slate, tile and ceramics
- Discarded plastic lab ware, empty bottles and containers

Comment Number: 1-H-6 continued
Docket Number: LDR-00110
Commenter: Thermal KEM/CyanoKEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

Fibrous Absorbent Materials

Non-pumpable, non-mixable material and scraps associated with the processing, handling, and cleanup of cyanide and metal salts and solutions are received in rolloff boxes and drum receipts inter-mixed with other types of waste and debris. These materials can be decontaminated for cyanide and soluble metal salt contamination but can still retain precipitated and adsorbed metal concentrations within their structures. Extensive washings are not effective at desorbing these metals. As in other cases with debris containing adsorbed and precipitated metals, TCLP tests show levels of metal can leach from samples of these decontaminated materials in excess of the non-wastewater land disposal standards developed for F006 and K062 wastes. Examples of these materials are:

- Discarded cartridge filter elements
- Filter cloths and similar fabrics
- Cloth, rags and paper products
- Rope, cord, and other braided fiber products

Floor Sweepings

Floor sweepings from areas contaminated with metallic salts are usually cleaned up last and added to a waste debris on top of all the other described debris so that it often covers and clings to the surfaces of other debris during shipment, storage, handling and processing of the contaminated debris. These sweepings contain small amounts of all the above described materials in addition to soils, dust, and sweeping compounds and associated salt and solution contamination. Typical examples of these materials are:

- Dry absorbent sweeping products
- Saw dust
- Small quantities of soils, clay and grit

Comment Number: 1-H-6 continued
Docket Number: LD12-00110
Commenter: Thermal KEM/Cyano KEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

These five groups of described debris materials are received for treatment in generally heterogeneous mixtures and also intermingled with waste salts, solutions and sludges requiring primary chemical treatments. The most practical method of isolating them from the chemical wastes undergoing chemical treatment is to physically separate them by their size density and insolubility. The resulting debris has to be managed for disposal as an intermingled conglomeration of materials.

We believe that in establishing BDAT standards, EPA considered only the chemically precipitated non-wastewater treatment residues such as sludges and filter cakes in addition to fine soils, clays and loams. These chemical precipitation products are discharged as a result of the chemical treatment reactions and are therefore "contained in" the initial hazardous waste. These materials can be pumped, slurried and processed by stabilization technology. On the other hand, debris materials having the characteristics described above are not generated by the waste treatment process reactions. For this reason, we believe they were neither considered nor evaluated by EPA in establishing BDAT for non-wastewater treatment residue with respect to TCLP leachable metal standards for land disposal. In EPA's proposed "Best Demonstrated Technology" (BDAT) background documents for F006, K062, K071, and D004/D010, the subject of debris treatment is not mentioned. Laboratory evaluations of "known" off-the-shelf debris type materials show that TCLP leachability from the debris is primarily due to the metallic composition of the debris. These materials can therefore leach metals at concentrations in excess of the non-wastewater BDAT treatment standards even after all the contaminating hazardous wastes have been removed.

Comment Number: 1-17-6 continued
Docket Number: LD12- 00110
Commenter: Thermal KEM / CyanoKEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

For debris waste, CyanoKEM has submitted data to the Third Thirds docket on December 22, 1989. This data can be used in setting BDAT standards specific for debris waste. We support the rescheduling of scrap metal debris shown on page 48469 of the proposed rule to the third thirds, and we urge EPA to complete the development work on debris waste metal BDAT standards based on data provided or extend the variance until appropriate standards are available.

Comment Number: 1-H-6 continued
Docket Number: LD12-00110
Commenter: Thermal KEM/ CyanoKEM
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

DEFINITION OF DEBRIS

We disagree with the definition provided for debris on page 48489 of the Third Thirds proposed rule. Buried whole drums should not be considered debris, contrary to the statement in the preamble to this proposed rule.

We have provided detail comments to the recently proposed rule on "Applicability of Land Disposal Restrictions to CERCLA Response Actions" - 54 Federal Register 41566-41569. In these comments we provide more appropriate definitions for debris, and urge EPA to adopt these definitions. Partially buried drums must not be considered debris, as these containers may hold substantial quantities of highly toxic waste materials that are amenable to treatment to BDAT standards prior to land disposal.

Comment Number: 1-H-6
Docket Number: LD12-00110
Commenter: ThermalKEM/CyanoKEM
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

The commenter expresses concerns about setting treatment standards below the characteristic level and describes a scenario involving the treatment of non-hazardous residue (from treatment of a hazardous waste that presumably was treated to a level below the characteristic level but not to a level achieving the treatment standard), and the treatment of a non-hazardous waste (by virtue of being below the characteristic level from the outset.) The Agency notes it is not barred from dealing with part of a problem rather than the whole; even though such inconsistencies may occur, overall environmental benefit is increased by regulating at least part of the problem.

This point, however, is not a factor to be considered under the final approach, because treatment standards for the majority of characteristic wastes are not being set below the characteristic levels.

As a point of information, the final Third Third rule contains revisions to 40 CFR 268.7 to deal with such problems as being unable to tell the difference between the origins of identical wastes.

The Agency is in then process of developing a separate rulemaking to address contaminated soil and debris. That is expected in 1992. The definition of debris will likely be refined based on data gathered as part of that rulemaking effort. The Agency was able to develop definitions of organic debris and inorganic solids debris within the time constraints of promulgating the Third Third rule, however, further refinement of the definition of debris was not possible at this time.

Comment Number: 1-H-7
Docket Number: LD12-00129
Commenter: Olin Chemicals
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

Olin also concurs with USEPA in its definition of "soil" and "debris" but requests that the Agency expand the "manmade materials" definition to include all building materials such as steel, brick, timbers, flooring, fiberboard (sheetrock), transite and roofing materials. Many sites being remediated under CERCLA require the destruction of buildings that were nominally contaminated during waste management or manufacturing operations. The material from these buildings need to be included in the definition of "debris."

Comment Number: 1-H-7
Docket Number: LD12-00129
Commenter: Olin Chemicals
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

The Agency is developing a separate land disposal restrictions rulemaking specifically for soil and debris. The Agency plans to refine the definition of debris within that rulemaking effort, since it had neither time nor resources to do so for the Third Third final rule.

Two treatability groups for contaminated debris were established in the Third Third for all characteristic metal wastes. The materials mentioned by the commenter, if contaminated with characteristic metals, would likely fall into either the "organic debris" subcategory or the "inorganic solids" subcategory (See preamble Section III.A.3.a.(2).)

Comment Number: 1-H-8
Docket Number: LD12-00137
Commenter: USPCI, Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

BDAT APPLICABILITY TO DEBRIS

USPCI suggests EPA recognize the difficulty of applying BDAT treatment standards to contaminated debris by recognizing that some materials (wood, transformers, steel, pipes, etc.) are just not suitable for chemical analysis using the prescribed methods. EPA should endorse the concept of "Not Suitable for Analysis" in the final rule as an acceptable form of compliance with the applicable standards in order to account for the special problems presented by debris. Establishment of the "Not Suitable For Analysis" criterion will allow for adequate enforcement because if the material is actually suitable for sampling and analysis then the enforcement officer will able be to conduct the sampling and analysis and demonstrate non-compliance.

Comment Number: 1-H-8
Docket Number: LD12-00137
Commenter: USPCI Inc
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

Inorganics such as slags, glass, concrete, bricks, and other inorganic solid debris have been defined by the Agency as the "nonfriable inorganic solids" treatability group. These as the inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require crushing, grinding, or cutting in mechanical sizing equipment prior to stabilization, limited to the following inorganic or metal materials: 1) metal slags, 2) glassified slag, 3) glass, 4) concrete (excluding cementitious or pozzolanic stabilized hazardous wastes), 5) masonry and refractory bricks, 6) metal cans, containers, drums, or tanks; 7) metal nuts, bolts, pipes, pumps, valves, appliances, or industrial equipment, and 8) "scrap metal" according to 40 CFR 261.1(c)(6). For this treatability group, the Agency has determined a two year national capacity variance and the standards for D004 through D011 wastes do not apply to "inorganic solids debris".

Comment Number: 1-H-9
Docket Number: LD12-00138
Commenter: ~~Ox~~ OxyChem
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

EPA Should Establish Separate BDAT Standards for Contaminated Soil and Debris.

OxyChem supports EPA's long-term objective of promulgating separate BDAT standards for certain "treatability groups" for contaminated soil and debris. Presumably, such separate standards will take into account the specific waste characteristics and matrix interferences of contaminated soil and debris.

OxyChem does not believe, based on our experience, that the site-specific treatability variance approach suggested by EPA will be workable. Our experience with the "delisting" program teaches us that such "variances" are extremely complicated and cumbersome, and frequently take several years to obtain. Thus, prompt remediation of contaminated soil and debris cannot be accomplished by using the site-specific variance approach unless EPA dramatically revises its procedures and its requirements for the data necessary to support such variance requests.

Comment Number: 1-H-9
Docket Number: LD12-00138
Commenter: Oxychem
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply. If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards.

In order to be granted a site-specific variance from the treatment standard, the petitioner must demonstrate to the Agency that because the physical (or chemical) properties of the waste differs significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

For metal wastes that are generated as an organo-metallic or in an organic matrix, including "organic debris" (rags, paper, cardboard, clothes, gloves, paints, paint chips, wood, grubbing materials, blankets, hoses, bags, resins, and PVC piping), the Agency has determined that they can be incinerated to destroy the organo-metallic bond or the organic matrix containing the metal, prior to subsequent treatment of the ash, in order to comply with a concentration-based standard or prior to application of the technology-based metal treatment standard. This does not preclude the washing or extraction of metals from an "organic debris" that is only a characteristic waste due to surface contamination.

Inorganics such as slags, glass, concrete, bricks, and other inorganic solid debris have been defined by the Agency as the "nonfriable inorganic solids" treatability group. These as the inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require crushing, grinding, or cutting in mechanical sizing equipment prior to stabilization, limited to the following inorganic or metal materials: 1) metal slags, 2) glassified slag, 3) glass, 4) concrete (excluding cementitious or pozzolanic stabilized hazardous wastes), 5) masonry and refractory bricks, 6) metal cans, containers, drums, or

Comment Number: 1-H-9
Docket Number: LD12-00138
Commenter: Oxychem
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response: (Continuation)

tanks; 7) metal nuts, bolts, pipes, pumps, valves, appliances, or industrial equipment, and 8) "scrap metal" according to 40 CFR 261.1(c)(6). For this treatability group, the Agency has determined a two year national capacity variance and the standards for D004 through D011 wastes do not apply to "inorganic solids debris".

Comment Number: 1-H-10
Docket Number: LD12-00143
Commenter: General Motors Corporation
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

Applicability of Treatment Standards to Soil and Debris

GM agrees with the Agency that "there are certain problems associated with regulating hazardous wastes in soil and debris matrices." We further agree that this issue should be addressed under a separate rulemaking (page 48469).

GM also strongly supports the Agency's proposal (page 48489) to grant a two-year extension of the effective date for contaminated soil and debris for which the treatment standards proposed are based on combustion, wet-air oxidation, vitrification, or mercury retorting.

We also recommend that scrap metal/listed waste mixtures should be exempt from the BDAT standards associated with the listed wastes (page 48469). Application of treatment standards would severely discourage much of the recycling of such metals by foundries and smelters, where the metals are used as substitutes for commercial products (261.2(e)(1)).

Comment Number: 1-H-10
Docket Number: LD12-00143
Commenter: General Motors Corp
Issue: General BDAT Aspects
Subissue: Soil & Debris
Response:

The Agency acknowledges the commenter's support. Related to the scrap metal/listed waste mixtures issue, the Agency wants to point out that for metal wastes that are generated as an organo-metallic or in an organic matrix, including "organic debris" (rags, paper, cardboard, clothes, gloves, paints, paint chips, wood, grubbing materials, blankets, hoses, bags, resins, and PVC piping), the Agency has determined that they can be incinerated to destroy the organo-metallic bond or the organic matrix containing the metal, prior to subsequent treatment of the ash, in order to comply with a concentration-based standard or prior to application of the technology-based metal treatment standard. This does not preclude the washing or extraction of metals from an "organic debris" that is only a characteristic waste due to surface contamination.

Additionally, inorganics such as slags, glass, concrete, bricks, and other inorganic solid debris have been defined by the Agency as the "nonfriable inorganic solids" treatability group. These as the inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require crushing, grinding, or cutting in mechanical sizing equipment prior to stabilization, limited to the following inorganic or metal materials: 1) metal slags, 2) glassified slag, 3) glass, 4) concrete (excluding cementitious or pozzolanic stabilized hazardous wastes), 5) masonry and refractory bricks, 6) metal cans, containers, drums, or tanks; 7) metal nuts, bolts, pipes, pumps, valves, appliances, or industrial equipment, and 8) "scrap metal" according to 40 CFR 261.1(c)(6). For this treatability group, the Agency has determined a two year national capacity variance and the standards for D004 through D011 wastes do not apply to "inorganic solids debris".

Comment Number: 1-H-11
Docket Number: LD12-00159
Commenter: Waste Mgmt, Inc. and Chemical Waste Mgmt., Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

Soil and Contaminated Debris (54 Fed. Reg. at 48,489)

In its November 22, 1989 preamble, EPA proposes to exempt certain scrap metal/listed waste mixtures from BDAT treatment standards. 54 Fed. Reg. at 48,469. Specifically, this exemption would be limited to scrap metal "that (1) has been unavoidably contaminated and (2) has had all listed waste removed by rinsing or other demonstrated decontamination techniques." Id. In addition, the Agency would require any scrap/listed waste mixture exhibiting a characteristic to comply with BDAT standards for such wastes. Id.

WMI supports the Agency's proposed management method for scrap metal/listed wastes and believes its promulgation in the final rule is essential to continued success of the land disposal restrictions program. In addition, the Agency should expand the scope of this exemption to include not only scrap metal but all other forms of debris.[4] To exclude items already defined by the Agency as debris (see footnote 1) will create an incentive to leave these items in place -- or ignore them -- rather than manage them properly in a Subtitle C land disposal facility.

Comment Number: 1-H°" continued
Docket Number: LD12-00159
Commenter: Waste Mgmt Inc. and Chemical Waste Mgmt. Inc
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

[4] The Agency defines debris as:

> "materials that are primarily non-geologic in origin, such as grass, trees, stumps, shrubs, and man-made materials (e.g., concrete, clothing, partially buried whole or crushed empty drums, capacitors, and other synthetic manufactured items).
>
> Debris may also include geologic materials (1) identified as not indigenous to the natural environment at or near the site, or (2) identified as indigenous rocks exceeding a 9.5mm sieve size that are greater than 10 percent by weight, or that are at a total level that, based on engineering judgment, will affect performance of available treatment technologies." 54 Fed. Reg. 48,489.

Comment Number: 1-H-11 continued
Docket Number: LD12-00159
Commenter: Waste Mgmt. Inc. and Chemical Waste Mgmt. Inc.
Issue: General BDAT Aspects
Subissue: Soil and Debris
Comment:

As explained below, these items simply cannot be treated by the methods applicable to "normal" wastes and, therefore, often cannot be treated to meet the established standards. Accordingly, WMI proposes a special management scheme that will take account of the unusual nature of these wastes.

A. Inapplicability of Stabilization to Contaminated Debris and Other Wastes

The physical form of many hazardous wastes precludes their treatment by conventional methods. For example, EPA has proposed to establish BDAT standards for nonwastewater forms of D005, D006, D007, D008 (low level subcategory), and D011 based on values achieved with stabilization of selected listed wastes. Such a broad transfer of treatment standards is inappropriate because it ignores the broad variety of waste types that may be encompassed within each of these waste codes. Stabilization is an appropriate treatment technology only for those wastes that can be reduced to particulate form or from which the metals of concern can be easily solubilized. While all of the wastes used by EPA in establishing the treatment standards meet these criteria, many of the wastes handled by a commercial waste treatment facility do not meet these criteria but nevertheless are EP toxic for metals. These wastes generally are solid materials and debris which either are contaminated with EP toxic metals or contain EP toxic metals, but which cannot be

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solubilized or reduced to particulate form. The following is a list of some of the wastes which have been received by WMI which are not suitable for stabilization. A copy of the waste profile for each waste is provided for more complete information (see Attachment A):

*J52332	Furnace brick, insulation, paper and other debris contaminated with lead, cadmium and barium
*J09839	Havolon rubber sheets contaminated with lead
*J62031	Nylon filters contaminated with cadmium, lead and trace cyanide
*M56581	Alumina crucibles, furnace brick, quartz furnace tubes and filter papers contaminated with zinc and cadmium sulfide
*G02806	Asbestos wall board containing barium, cadmium, chromium, lead, mercury, and selenium containing pigments
*G92552	Hypalon lining contaminated with lead (105 mg/l of lead by EP toxicity test)
*X10510	Disposable clothing contaminated with lead
*J13415	Off-spec color picture tubes containing lead (25.7 mg/l lead by the EP toxicity test)
*G37954	Air filters used to remove lead particles from air in an indoor rifle range
*F87607	Paper paint filters containing chromium and lead

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*U66719	Chromium contaminated process equipment and concrete from demolition including piping, tanks, wooden flooring, concrete, fiberglass insulation and debris such as PPE
*H35429	Steel chrome plating tank with brick and rubber liner
*V94942	Refractory brick contaminated with chromium (18.1 mg/l chromium by EP toxicity test)
*H36567	Asphalt based roofing material contaminated with cadmium sulfide, mercury sulfide, cadmium selenide and barium sulfate
*J95329	Lead contaminated concrete from demolition of walls and floors
*J62141	Wood block flooring contaminated with silver and trace cyanide
*J73601	PCB and lead contaminated soil and demolition debris from spills in a plasticizer tank area
*V95021	Siemen's valves (cast iron and steel) containing lead and arsenic
*M56040	Cathode ray tubes containing lead
*K33326	Fabric filter bags contaminated with barium chloride
*F89172	Blast furnace sludge from steel manufacturing (15 mg/l lead by EP toxicity test)

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While it may be possible to treat some of these wastes to make them amenable to stabilization by, for example, incinerating organic wastes or decontaminating surface contaminated wastes that have nonporous surfaces, such treatment will be impossible for other wastes. For example, there is no effective treatment available for asbestos that is contaminated with metals. Similarly, there are other wastes that cannot be incinerated and cannot be made amenable to stabilization. Moreover, shifting a large volume of these wastes to incineration, will impose a strain on the nation's already limited incinerator capacity that was not accounted for by the Agency in its capacity calculations.

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Soil and debris that are contaminated with prohibited wastes are subject to the land disposal restrictions and must meet the treatment standard for the contaminating waste prior to land disposal. The Agency realizes, however, that there are certain problems associated with regulating hazardous wastes in soil and debris matrices. Because of such problems, the Agency is preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris. Until soil and debris can be better organized into treatability groups, promulgated treatment standards apply. If the contaminated soil and debris cannot be treated to meet the promulgated treatment standards, alternative treatment standards can be established under a site-specific variance from the treatment standards.

In order to be granted a site-specific variance from the treatment standard, the petitioner must demonstrate to the Agency that because the physical (or chemical) properties of the waste differs significantly from the waste analyzed in developing the treatment standard, the waste cannot be treated to specified levels or by the specified methods.

The Agency wants to point out that for metal wastes that are generated as an organo-metallic or in an organic matrix, including "organic debris" (rags, paper, cardboard, clothes, gloves, paints, paint chips, wood, grubbing materials, blankets, hoses, bags, resins, and PVC piping), the Agency has determined that they can be incinerated to destroy the organo-metallic bond or the organic matrix containing the metal, prior to subsequent treatment of the ash, in order to comply with a concentration-based standard or prior to application of the technology-based metal treatment standard. This does not preclude the washing or extraction of metals from an "organic debris" that is only a characteristic waste due to surface contamination.

Additionally, inorganics such as slags, glass, concrete, bricks, and other inorganic solid debris have been defined by the Agency as the "nonfriable inorganic solids" treatability group. These as the inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require crushing, grinding, or cutting in mechanical sizing equipment prior to stabilization, limited to the following inorganic or metal materials: 1) metal slags, 2) glassified slag, 3) glass, 4) concrete (excluding cementitious or pozzolanic

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stabilized hazardous wastes), 5) masonry and refractory bricks, 6) metal cans, containers, drums, or tanks; 7) metal nuts, bolts, pipes, pumps, valves, appliances, or industrial equipment, and 8) "scrap metal" according to 40 CFR 261.1(c)(6). For this treatability group, the Agency has determined a two year national capacity variance and the standards for D004 through D011 wastes do not apply to "inorganic solids debris".

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Comment:

D. Lead-Contaminated Soil and Debris

In its proposed land disposal restrictions, EPA has not specifically proposed a national capacity variance for soil and debris contaminated with lead. In a separate rulemaking, however, EPA has requested comments on whether land disposal restrictions should apply to response actions conducted pursuant to CERCLA. 54 Fed. Reg. 41566 (1989). Specifically, EPA indicated that the removal, treatment, and replacement of contaminated soil could be allowed without triggering the applicable land disposal restrictions because such activities "simply serve to improve the characteristics of disposed waste to insure long-term environmental protection" and would enable property owners "to design sensible, protective remedies that are tailored to fit site-specific conditions" without imposing additional regulatory burdens.

Notwithstanding this rulemaking, a national capacity variance for lead-contaminated soil and debris should be granted in order to both avoid any impediment to prompt and environmentally sound cleanups under CERCLA, and to encourage voluntary cleanups at contaminated sites. Without such a variance from the land disposal restrictions, property owners would be reluctant to conduct any cleanup voluntarily and to assume the additional expense of compliance with the applicable land disposal restrictions. Rather, property owners would be encouraged to wait until a cleanup order under CERCLA was issued. Furthermore, such a national capacity variance would be appropriate until sufficient capacity to treat the contaminated soil and debris to the proposed BDAT standards becomes available. Accordingly, a national capacity variance for lead-contaminated soil and debris is consistent with EPA's policy to encourage prompt cleanups under CERCLA, as well as voluntary cleanups, and should be granted for lead-contaminated soil and debris until sufficient capacity is available to meet the proposed BDATs for D008 waste.

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Commenter: Andrews & Kurth
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Response:

There has, since the beginning of the land disposal restrictions program, been no doubt that the land ban applies to contaminated soil and debris if it contains prohibited hazardous waste. In the case of soil that is contaminated by multi-source leachate, such a waste is subject to the applicable treatment standard (nonwastewater) and must meet the F039 constituent standards prior to land disposal.

The commenter mentions a supplemental notice issued by the Agency on October 10, 1989 and requests clarification on the two rulemakings. The supplemental notice issued October 10, 1989 applied to CERCLA response actions and requests comments on an expanded application to RCRA corrective actions. The Agency has yet to make a determination on the applicability of the notice to RCRA corrective actions. The land ban, has a much broader applicability encompassing all contaminated soils, excluding those generated at a CERCLA response action.

The Agency acknowledges that there may be a need to further subcategorize multi-source leachate into treatability groups. The Agency has neither the time nor the resources to develop such groups within the time constraints of promulgating the Third Third final rule. If a generator of leachate-contaminated soil (or groundwater) finds that it is impossible to meet the promulgated F039 treatment standards due to physical or chemical differences in the waste, he/she may apply to the Agency for a site-specific (or general-applicability) variance from the treatment standard. As part of the demonstration, the generator must present the treatment technology that he/she believes represent BDAT for the waste, and provide supporting data. If such a variance is granted, a new treatment standard will be developed for the waste at that site, or in the case of a variance with general applicability, for the new treatability group.

In response to the commenter's last point, that of providing flexibility in selection of remediation techniques due to the variability of the contaminated media, the Agency agrees there is a need to provide such flexibility. It has, therefore, established concentration-based treatment standards for multi-source leachate (and many other hazardous wastes) that provide such flexibility because such standards may be met using any treatment technology except one that is actually impermissible dilution or land disposal.